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E. E. PRATT, Chief

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SPECIAL AGENTS SERIES—No. 117

LUMBER MARKETS
OF THE WEST AND NORTH COASTS
OF SOUTH AMERICA

By

ROGER E. SIMMONS
Special Agent



WASHINGTON
GOVERNMENT PRINTING OFFICE
1916

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LETTER OF SUBMITTAL.

DEPARTMENT OF COMMERCE,
BUREAU OF FOREIGN AND DOMESTIC COMMERCE,
Washington, May 19, 1916.

SIR: There is submitted herewith a report by Special Agent Roger E. Simmons reviewing the lumber production and trade in the west and north coast countries of South America, Chile, Peru, Ecuador, Colombia, and Venezuela. This report completes the record of the investigations conducted by the Bureau of Foreign and Domestic Commerce into the lumber trade of South America, a similar report for Argentina, Uruguay, and Brazil having been published as Special Agent Series No. 112. In the present report, Bolivia is treated incidentally and only in connection with shipments for La Paz received at Arica, Chile, and Mollendo, Peru; and Trinidad and Curaçao receive incidental treatment as transshipping points in the Venezuela trade. Among the topics discussed with regard to the other countries are the domestic lumber resources and industry, the lumber imports and their distribution, the species, dimensions, costs, prices, uses, etc., of imported lumber, business conditions, and suggestions for expanding American trade. Supplementary data are given concerning certain special wood products—furniture, matches, cars and ships, ties, poles, boxes and shooks, wood pulp, barrels, flooring and ceiling, and sash, doors, and blinds.

The Douglas fir that constitutes almost the entire amount of United States lumber shipments to Chile and Peru seems to be generally satisfactory in dimensions, measurements, and grading, so that the west-coast lumber trade has been conspicuously free from the claims and controversies that have characterized the trade in American pine on the east coast. Therefore Chile and Peru, though a smaller market than Argentina, Uruguay, and Brazil, possess the valuable asset of confidence in United States products and cordiality toward American exporters.

Ecuador is unique in using practically no imported lumber; but it would offer a promising field if the barriers of a high tariff and certain local statutes could be removed. Practically all the lumber imported by Colombia and Venezuela comes from the United States,

but the amounts are small—2,000,000 board feet annually for Colombia and 3,000,000 feet for Venezuela. The limited use of wood in both countries (the total consumption is only 13,000,000 feet in Colombia and 8,000,000 feet in Venezuela), in comparison with cement and other materials, points to the need of a lumber-advertising campaign, through which these markets might be greatly extended.

Respectfully,

E. E. PRATT,
Chief of Bureau.

To Hon. WILLIAM C. REDFIELD,
Secretary of Commerce.

LUMBER MARKETS OF THE WEST AND NORTH COASTS OF SOUTH AMERICA.

CHILE.

INTRODUCTION.

In studying the world's lumber markets, it is important to determine the extent and character of the supply that the forests of Chile may be expected to yield. The impression is current among not a few lumber dealers and consumers on the east coast of South America and prevails generally in Chile that the vast untouched woodlands of this Republic need only exploitation to become a permanent and important source of supply for valuable lumber, sufficient, it is thought, to serve all the needs of Chile, a large part of the demand from other South American markets, and, to a limited extent, for shipments to Europe. To discover how far the general belief accords with the facts, this investigation has gone more deeply into the details of forest conditions in Chile than was found necessary in similar studies in other South American countries; and the prospects were found to be neither so glowing for native woods nor so discouraging for foreign woods as the commonly accepted rumor would indicate. The situation has a special interest for American lumber producers and exporters, direct, if they are concerned with Chile, and indirect, through its bearing on consumption in other South American countries, if they are concerned with South America at all. The report attempts an accurate description of existing conditions in Chile, on which may be based a forecast of the economic value of these far reputed timber-lands.

Chapter I.—GENERAL DESCRIPTION OF THE COUNTRY.

Of the west-coast countries of the southern continent, Chile is most important in natural resources and in commercial and industrial development. Of the 10 countries in South America it ranks third, coming immediately after Argentina and Brazil. The country is unique in shape, running over 2,500 miles north and south in a narrow strip, averaging 100 miles in width, between the Andes on the east and the Pacific Ocean on the west. Its northern boundary lies within the region of perpetual summer and its southern extremity extends into regions where winters are long and often severe. Over 800 miles of

northern Chile is rainless, whereas southern Chile has a rainy season of seven or eight months and frequently an annual precipitation of as much as 85 inches. This range of climate results in a great variety of plant life, which probably can not be equaled in any other country of like area.

INDUSTRIAL AND COMMERCIAL DIVISIONS.

Commercial and industrial Chile is divided into three distinct regions. "Centro del pais," the central section, although the smallest, is most thickly populated. Here are situated the principal seaport of the Republic, Valparaiso, and the capital, Santiago, which is also the metropolis. In this region, extending from Port Coquimbo almost to Concepcion, horticulture and vine growing are valuable and growing industries made possible by irrigation. If the project for extending the system of watering these lands is carried to completion, which appears likely, it will make this section remarkable for its productivity and should prove an attraction to desirable immigrant classes. This section is also the center of the largest part of Chile's manufacturing business. It contains factories for cement, textiles and clothing, boots and shoes, paper, leather goods and metal, grain, tobacco, and chemical products, and has shipbuilding, vehicle, and other wood-using industries. The factories making commodities from wood, in number of establishments and probable total labor employed, are first in Chile, and in the amount of capital invested are second only to the flour mills.

The northern section of Chile is usually called the "nitrate region." Although in these parts are located the only extensive beds known of "caliche," from which sodium nitrate is extracted and iodine is made, this region might more appropriately be termed the mineral district, for here are also located rich deposits of copper, iron, silver, and gold, and borax and salt beds. Extensive and modern equipment for the exploitation of these resources belongs largely to English, German, and American interests, and its active operation brings many million dollars annually to the Republic. The opening of the Panama Canal has already given a stimulus to the exploration of parts where large bodies of ore are believed to exist, and resulted in the opening of new mines and *oficinas*, and in projects for new ore-carrying railroads, private and governmental. These prospective developments, well under way, indicate what may be anticipated in this section with the general improvement of international business that is expected to follow the cessation of hostilities in Europe.

Southern Chile includes the grain-producing section from Concepcion to Puerto Montt, and the area devoted to grazing and the rearing of live stock, from Puerto Montt to Punta Arenas. These pursuits, next to mining, are the most important in Chile. Each year sees forest areas replaced by grain fields and pasture lands. In clearing, lumbering receives considerable attention; it is third in value among the country's industries and is confined to this southern region. Coal mining also belongs to this section of Chile, where deposits under the sea are being mined. The finding of ex-

tensive areas of better grades of coal farther south in the Province of Cautin, etc., superior in quality, it is claimed, to Australian coal and nearly as good as coal imported from Wales, bids fair to bring about developments of considerable magnitude. These fields are along the route of the new Transandine Railroad through the Lonquimai Pass, which is finished on both the Chilean and the Argentine side, with the exception of connections aggregating about 150 miles. These, when built as planned, will complete a railroad with a uniform gauge below the Andean snow line from Buenos Aires to Valparaiso. With this advantage the southern region of Chile will doubtless in time fill part of Argentina's demand for fuel in addition to supplying its own needs.

In all regions, therefore, the nation's growth, based upon the development of natural resources more easily available than ever before and proved to offer good returns, is most assuring. The economic advance in many lines in Chile is already considerable. With the opening of the Panama Canal, a new era may be predicted for the west-coast Republics, in which Chile bids fair to take the lead.

POPULATION, CITIES, RAILROADS, ETC.

The population of Chile is estimated at 3,500,000. The native inhabitants, like those of the neighboring countries, have sprung from Indian and Spanish stock and have no negro blood. To favorable climatic conditions is commonly attributed their development into a vigorous, intelligent, industrious, and progressive people. Even the most primitive have taken to agriculture, herding, and lumbering. Chile's resources and climate, moreover, have attracted foreigners with capital. Numbers of Germans and English, most desirable types of settlers, have assumed a leading part in the nation's commercial expansion.

Because of the long-continued importance of water transportation, civic development in north Chile has been confined to the seacoast. In the central and southern sections the first and the third largest of the Republic's cities, Santiago and Concepcion, are situated inland, and Temuco, Chillan, Talca, Curico, and Valdivia are thriving, substantial urban centers in the interior. Their rapid growth has been due largely to excellent railway facilities connecting them with principal markets, and many other points of commercial advantage. The artery of trade for these towns is the Central Railway, with its branches, running 700 miles from Valparaiso south to Puerto Montt, which affords the best railroad facilities in Chile. Chile has in operation 19 railways with over 4,000 miles of track. Many of these lines, privately owned, have been built in connection with mining operations, while others are parts of transcontinental projects designed to connect various Atlantic and Pacific ports. Most of the mileage belongs to roads owned and operated by the Government, including the Longitudinal line, designed to run north and south through Chile, connecting Arica, near the Peruvian line, with Puerto Montt, in south Chile. A considerable portion of this road is already completed and in operation.

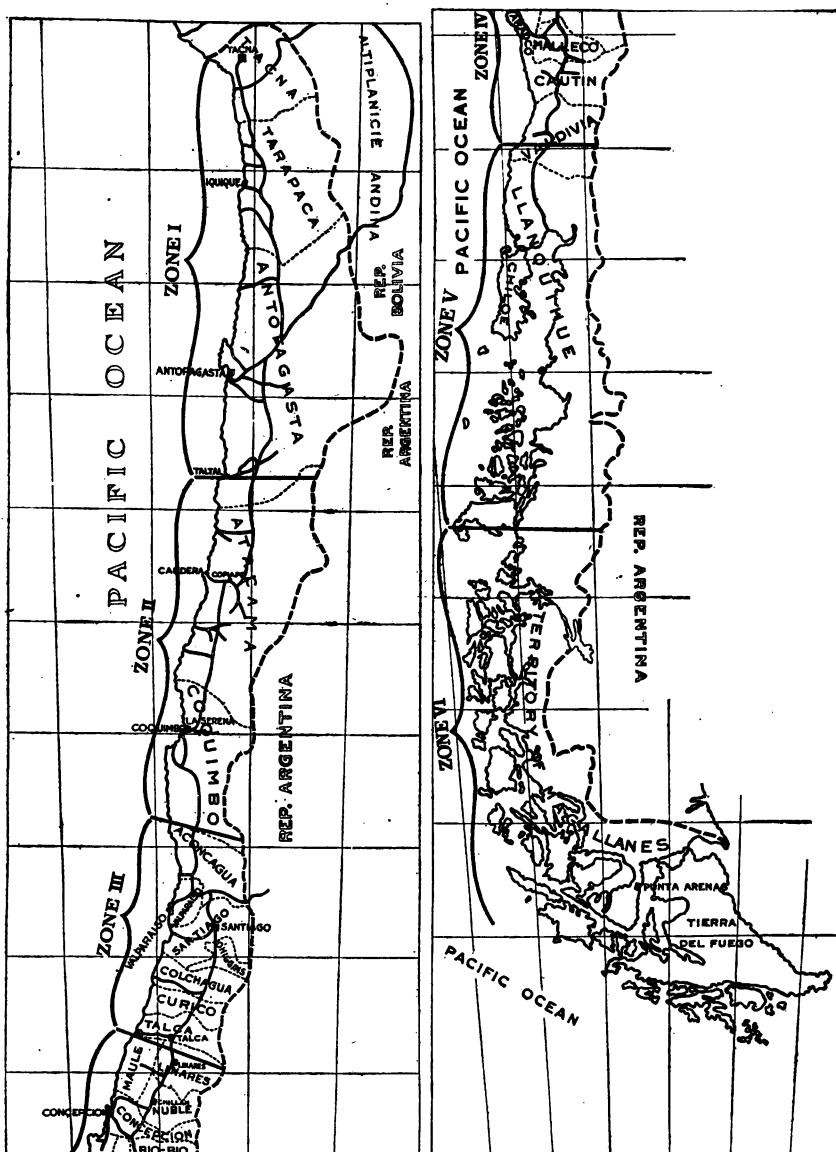
The Republic's principal markets and business centers, their approximate population, principal industries, and sources of lumber supply are shown in the following table:

Towns and cities.	Population.	Lumber sources.	Principal industries.
Arica.....	7,000	United States.....	Shipping, mining.
Iquique.....	40,000	United States, south Chile.....	Nitrate, iodine, salt.
Taltal.....	11,400	.....do.....	Borax, alum, gypsum, borate of lime.
Antofagasta.....	38,500	.....do.....	Marble, mercury, silver.
Caldera.....	2,800	United States.....	Gold, sulphur, etc.; car building.
Coquimbo, etc.....	20,000	United States, south Chile.....	Iron and silver mining, agriculture, vineyards, dairying, planing mill, furniture shops.
Valparaiso.....	180,000	United States, south Chile, Europe.	Shipping, sugar refineries; cement, tannin, preserving and canning, soap, and spaghetti factories; horticulture, agriculture, planing mill; summer resort.
Santiago.....	388,000	.....do.....	Vineries, flour mill; textile, paper, and planing mills; shoe, hat, furniture, and box factories; vehicles, building, horticulture, agriculture, railroading, sash and doors; seat of Government.
Curico.....	21,000	United States, south Chile.....	Flour and planing mills, spaghetti factory, viticulture and agriculture, leather.
Talca.....	40,000	.....do.....	Flour and planing mills; match, biscuit, and metal-bed factories; shipbuilding, agriculture, vehicles, vineries, tanneries, horticulture.
Chillan.....	39,000	.....do.....	Shipping, railroading, sugar refineries; flour, textile, and planing mills; coal mining, sawmill, brewery.
Concepcion-Talcahuano	85,000	.....do.....	Saw, shoe (box), flour mills; lumbering, tanning, planing mill, sash and door factory, agriculture.
Temuco.....	25,000	South Chile.....	Whaling, ship and car building; saw, shoe, sash and door factories; tanning, breweries, foundries, shipping, agriculture, fishing, lumbering, stock raising.
Valdivia-Corral.....	23,000	United States, south Chile.....	Canned and frozen meats, dried fish, whaling, stock raising, oil, wool, hides, shipping, planing mill.
Puerto Montt.....	7,000	South Chile.....	
Punta Arenas.....	24,000	Europe, south Chile.....	

^a In Constitucion.

PORTS.

Notwithstanding the large number of port cities among the market centers of Chile, not one is so improved as to afford sufficient depth and docking facilities for ocean schooners and liners. In Valparaiso, the Republic's most important port, and in many of the other ports ships are exposed to west and northwest gales, and for harbor safety need the protection of breakwaters and other improvements. Talcahuano, on the bay of the same name, and Coquimbo offer the best natural harbors of Chile's long coast line. Arica is one of the best ports exposed to the ocean. Its rapidly growing importance is due to the recent completion of the railroad providing direct connection with La Paz and northern Bolivia. In Chilean ports boats of practically all classes drop anchor, discharging and loading by means of lighters. In periods of rough weather this system causes serious and costly delays and often occasions a relatively large percentage of loss by breakage due to unavoidable rough handling. In the case of lumber this item and the loss from pieces falling overboard represent considerable amounts.



Map of Chile, showing forest zones.

Chapter II.—CHILE'S LUMBER RESOURCES.

FOREST ZONES.

The forest area in Chile is usually divided into six "zones." The first zone comprises the three northern Provinces of the Republic, the rainless region in which the nitrate business is conducted. The boundaries and extent of the six zones may be seen on the accompanying map.

These timber stands, except the limited areas extending from Chile over the Argentine frontier, are the only forests of any country that range almost entirely in the South Temperate Zone. Knowing the potential value of the forest resources of the North Temperate Zone of both hemispheres, many in lumber market circles and others expect much of the Chilean timber lands and of their capacity to produce soft, workable lumber in large quantities.

The following table, prepared from the Chilean Government's Forest, Fish, and Game Section, presents estimates of the total area of the forest zones, the forest cover in each zone, the area of the forests that are available for lumber, and the percentage of forest cover in each zone that is available for lumber:

Regions.	Total area.	Forest cover.	Lumber forests.	
			Acres.	Per cent.
Zone I.....	46,677,500	5,250	.....	.....
Zone II.....	28,611,750	229,250	.....	.....
Zone III.....	16,914,000	1,752,500	30,000	1.71
Zone IV.....	21,860,625	4,962,500	1,767,500	35.62
Zone V.....	31,187,375	12,162,500	1,025,000	8.43
Zone VI.....	42,859,500	20,250,000	700,000	3.46
Total.....	188,110,750	39,362,000	3,522,500	8.95

Except scattered instances in Zone III of poplar (*Populus pyramidalis*), mostly planted, and aggregating only a small area, there are practically no stands of trees of lumber size and of marketable kinds in Zones I, II, and III, which regions together constitute almost half of Chile's total area. The extent of forest cover (small trees) in Zone III, because close to the largest markets, is commercially important for its supply of firewood and charcoal and also for an abundance of quillai (*Quillaja saponaria*), of which the bark is noted as soap bark, important among Chile's exports. The yield of saponaceous material in this bark is said to be 15 to 25 per cent.

The northern Provinces of the fourth zone have considerable forested areas, but the growth is small and consists of kinds important only for firewood, charcoal, soap bark, etc. There is not sufficient merchantable native timber left to meet the local demand of these Provinces for lumber and other forest products. The supply has to be brought from the lower portion of this zone, south of the River Bio-Bio. Here the extent of forest land is about 5,000,000 acres, of which more than 1,700,000 acres contain timber of merchantable size. These forests contain the most common lumber trees in Chile—roble, rauli, coigüe, and nirro, with which are scattered

lingue, laurel, luma, avellano, and other hardwoods of minor importance. The softwoods belonging to this zone are araucaria (Chilean pine), cypress, and mañío. The first two are relatively abundant in their habitat on the Andean slopes. The center of the region of lumber production, which has been moving gradually southward, is now in the extreme southern part of Zone IV and the adjoining northern part of Zone V. This not only is the scene of the most active lumbering operations but constitutes the region of the greatest forest riches in Chile.

In the fifth zone, extending from the River Valdivia to the peninsula of Taitao, rauli and laurel (the lumber of which, with roble pellin, is in greatest demand in Chile) and araucaria do not appear. The roble pellin, Chilean cypress, coigüe, lingue, and mañío occur infrequently in the extreme northern part, only as far as the Chacao Canal. Below this are found teniu, tiaca, maiten, and several other hardwoods of little commercial consequence. The roble de Chiloe is cut, but the wood has little value, and that of roble Magallanes has less. The most important hardwood in this zone is ulmo, and the softwoods alerce and cypress of Guaitecas, which for general usefulness produce the best lumber of any trees cut in the Republic.

The sixth zone is the Magallanes Territory and Tierra del Fuego. The forested area contains only small districts that have trees important for lumbering. The valuable trees, alerce, ulmo, cypress, and the robles, grow only in the northern part. Southward these species either disappear or become dwarfed and range in brush form.

Even if advantageously situated, this zone, with its scattered merchantable stands, would hardly command attention as a minor lumber center. In fact, at present the lumber needs of the sparsely settled communities in this region are largely supplied by imports from the northern zones and from Europe. Far distant as this region is from markets, with no transportation facilities and few resources to justify development, these forests, like those in Zones I, II, and III, may be eliminated as a probable source of supply.

REGION OF GREATEST LUMBERING ACTIVITY.

Zones IV and V remain as containing important lumber forests. The former has constituted the nation's lumber-supply region for more than 30 years, and still has the largest forest areas of merchantable timber in the Republic. Had commercial exploitation been the only drain on this zone's timber resources, there would have been available millions of acres more of lumber woodland. The desire for agricultural lands, however, prompted settlers to destroy the forests by fire without considering the suitability of the land for crops. As a result, this region, with its vast expanse of uncovered and corroded slopes, its sand hills, barren watersheds, areas damaged from increasing overflows, and notably decreasing water supply illustrates vividly the price a nation pays for neglecting its forests.

On the 1,800,000 acres of merchantable-size timber remaining in Zone IV, the rauli has been estimated at the present rate of cutting to last 20 years, the laurel 30 years, the ulmo 50 years, and the roble 90 years. This does not mean that timber of these kinds and of

this quantity suitable for lumber is available. The surface conditions of this zone are rugged and mountainous, presenting difficult and costly logging problems that preclude the cutting of extensive areas. Again, large tracts of forests remote from transportation will become available only in future years as railroad developments occur. Among the hardwoods of Chile are good-sized trees that are hollow or otherwise defective, and practical lumbermen put the proportion of merchantable virgin forests at not over 35 to 60 per cent of the stand, varying in different localities. This estimate does not include species of lumber size but of minor marketable value.

Forests in the northern part of the fifth zone contain extensive areas of virgin timber remarkable for size and thick stands. As before stated, they contain only a small percentage of a few kinds that are common on the market or that will make valuable lumber but an abundance of many kinds of heavy inferior wood of little commercial value. South on the Island of Chiloe and lower in the Province of Llanquihue are the coniferous forests of alerce and cypress. Obstructing the marketing of these woods are lack of transportation facilities and the doubt whether the woods exist in sufficiently abundant stands to attract the large outlay of capital for boats, logging, railroad, and other equipment necessary for their exploitation on a paying basis. Therefore, the fifth zone as a lumbering center bids fair to be little, if any, more important for many years than it is at present.

CONCLUSIONS AS TO CHILE'S LUMBER RESOURCES.

From the facts presented, the following conclusions may be drawn as to Chile's lumber resources:

1. The hardwoods that have attained marketable importance in Chile (rauli, laurel, lingue, etc.) are confined to stands in the southern part of the fourth zone, of which the available areas are limited, and the present production is beginning to reflect the increasing scarcity.
2. The continued burning to clear lands for crops and pasture precludes any possibility that second-growth forests of these species will attain importance.
3. Chilean pine, alerce, and cypress are growing in situations too difficult for commercial exploitation or else in too limited or too scattered stands to become more than a minor factor in production.
4. In the fifth zone there is a preponderance of heavy, refractory hardwoods of doubtful commercial value, and there are a few coniferous or light lumber woods that will answer for purposes of general utility.
5. Not only are the forests of Chile not likely to become important lumber-supply centers for export material, or for furnishing markets of other South American countries, but it is evident that as time goes on the nation will probably depend more and more on imported lumber for structural and general-utility purposes, for tight cooperage stock, and for medium and high class furniture woods.

REFORESTATION.

The work of reforesting hillsides, sand hills, and other lands unprofitable for agriculture has made a notable start in Chile. Already the areas planted aggregate about 148,000 acres. The Forest Service's operations have been circumscribed by lack of funds. In the last 15 years this bureau has been able to set out transplanted trees on less than 1,000 acres. A few municipalities in Chile, to adorn their surroundings, have reforested considerable areas on outlying slopes. The cities of Concepcion and Curico have been particularly interested in these undertakings.

The most extensive forest plantations are in the hands of private owners, the principal ones being corporations engaged in coal mining. They have set out to reforest the surface of their vast holdings in the Provinces of Concepcion and Bio-Bio, and have been conducting this work for 21 years. The coal companies have more than 124,000 acres of new growing forests. The company with the largest area under the technical management of foresters holds tracts of about 75,000 acres. It is said that for 10 years the company has been able to obtain almost all its prop timbers off its plantations.

No native species has been used in any planting work in Chile. For a number of years the two varieties almost exclusively set out were *Pinus insignis*, which in California is commonly called Monterey pine or spreading cone pine, and *Eucalyptus globulus*, the tree brought from Australia that has been widely planted in California. Later *Pinus maritima* began to be widely set out and has shown gratifying results. Recent plantations have included large quantities of eucalyptus (principally *Eucalyptus resinifera*, *E. globulus*, *E. robusta*, *E. gomphocephala*, and *E. diversicolor*) and several kinds of cypress (*Cupressus macrocarpa* (Monterey cypress in the United States), *C. torulosa*, and *C. glauca*). *Acacia melanoxylon* and *Robina pseudoacacia* have also become favorites on account of the merits of the woods and their fairly rapid growth.

NATIVE WOODS.

There are 30 species of trees in Chilean forests that are considered valuable for lumber. A number are infrequent, others stand in inaccessible situations, others are generally undersized or remote, and some are capable of producing only poor-quality lumber. The names and the botanical classification of those common on the market or likely to become of economic importance in the near future are given in the following table, together with their locations, weights, colors, properties, and uses:

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Common names.	Scientific names.	Zones in which found.	Approximate weight per 1000 feet.	Color, etc.	Properties.	Uses.
Roble.....	<i>Fagus obliqua</i>	Third, fourth, and fifth.	5,500	Rose red.....	Very heavy and strong, fairly hard, fine texture, durable, difficult to season, checks easily worked.	Posts, poles, crossties, construction work, crossing planks, paving.
Rauli.....	<i>Fagus procera</i>	Fourth.....	3,500	Reddish pink, violet cast; satiny lustre; handsome.	Fairly heavy and strong, elastic, not durable, easily seasoned, shrinks stable, fine texture, not hard.	Sash, doors, furniture, interior trim, staves, flooring, panels, boxes, trunks, ceiling.
Lingue.....	<i>Persea lingue</i>	Fourth and fifth.....	4,000	V a r i a b l e , usually brown, with red and yellow cast; conspicuous pith rays.	Ring-porous, heavy, stiff, durable, straight grain, workable, hard, strong, coarse texture; seasons well, shrinks moderately stable.	Furniture, interior trim, fixtures, quarry, doors, vehicle parts, yokes.
Laurel.....	<i>Laurelia aromatica</i>	Fourth.....	3,000	Yellow, with olive cast, spotted dark brown; pores diffused.	Strong, light, flexible, not heavy, hard, not durable, fine texture, indistinct rings, shrinks, works easily.	Boxes, planing-mill products, cheap flooring, kitchen furniture, chairs, trunks.
Coigüe.....	<i>Fagus Dombeysi</i>	Third, fourth, and fifth.	5,500	Red to pink, yellowish cast; indistinct rays; pores numerous and diffused; considerable sap.	Very heavy and strong, if red, durable; if pink, perishable; not elastic, moderately workable, very hard and difficult to season.	Unimportant construction work, poles, crossties, joists.
Chilean pine (Peruén). ^a	<i>Araucaria imbricata</i> ...	Fourth.....	4,200	Brownish white; non-porous; annual rings distinct.	Elastic, easily worked, not easily season, not durable, checks, fairly strong, resinous, fairly soft.	Sash, doors, planing-mill products, hidden work of furniture, wood pulp.
Alerce c.	<i>Fitzroya patagonica</i> ...	Fifth and sixth.....	2,700	Dark red, with conspicuous darker summer wood rings.	Very light, fairly strong, soft, splits easily, smooths and works easily, very durable, shrinks slightly, holds its place, resinous.	Shingles, planing-mill products, furniture, interior and exterior siding, cornice, sash, doors.
Cypress ^a	<i>Libocedrus chilensis</i> ; <i>Libocedrus tetragona</i> .	Third, fourth, fifth, and sixth.	3,000	Creamy spring-wood rings, with distinct grayish brown summer wood; indistinct pores.	Light, not strong, elastic, not hard, aromatic, easily worked and seasoned stable, very durable.	Posts, poles, pickets, lumber, planing-mill products.
Ulmo	<i>Encryphis cordifolia</i> ...	Fourth, fifth, and sixth.	4,400	Brown with reddish cast; ring-porous.	Heavy, very hard and strong, durable immersed, works well, not easily seasoned.	Flooring, vehicle parts, yokes, ears, plating, crossties, poles, furniture.
Luma.....	<i>Myrtus luma</i>	Fourth and fifth.....	6,000	Dark red, with decided lavender cast.	Very heavy and strong, resilient, very compact, stable, durable.	Vehicles, construction work, pick and tool handles, crossties, railroad uses.
Madroño.....	<i>Podocarpus chilina</i> ...	Fourth and fifth.....	3,200	Brownish white, fairly distinct annual rings; resinous.	Light, soft, strong, stiff, easily worked, resonant, fairly easy to season, stable in place, straight grain.	Planing-mill products, door panels, sash, furniture, cornices, vehicle bodies.

HARDWOODS.

Roble.—The major portion of Chile's timbered areas comprises beech forests. Like the common American beech, they have been classified botanically as *Fagaceæ*. There are seven species, remarkable in the widely varying qualities of their wood. The most plentiful, considering all regions, are those given the common name of *roble*: *roble pellin* (*Fagus obliqua*), *roble de Chiloe* (*Fagus nitida*), and *roble Magallanes* (*Fagus betuloides*). The last two are large, straight-bodied, and plentiful in the extreme southern part of the Republic, but are not prized for lumber. The *roble pellin* is the most common wood on the Chilean market. Its interlaced structure and proven durability makes it an ideal crosstie material. In contact with the soil it is known to last 20 years, which commends it more than any other native wood for telegraph poles and fence posts. When cut into lumber it is usually sawn into dimensions for structural uses, such as scantling, beams, rafters, joists, etc. *Roble pellin*'s excessive weight is its greatest commercial handicap; moreover, it is susceptible to checking and twisting and is exceedingly difficult to season. Because of the last-mentioned fact it goes into commerce and into construction green. It is an indifferent lumber wood; but in Chile it is the chief competitor of *Douglas* fir for structural purposes, because of its abundance and low price.

Rauli.—*Rauli* is a valuable lumbering tree because of its height, large and usually symmetrical circumference, and straight trunk. Although a beech, the wood, except in its reddish color, is dissimilar to its relatives, the *robles* and *coigues*. Both the latter are very heavy, whereas the *rauli* is lighter, much softer, and more easy to smooth and work. It is not as strong nor as durable exposed as the *roble*, but is easier to season, being successfully air-dried and kiln-dried and more stable in place. The wood goes into more uses and is more widely sought than any other lumber cut from Chilean forests. In its applications *rauli* can be likened to white pine in the United States and Spanish cedar in Brazil and Argentina, being the principal sash and door wood. It has a satiny luster and in structure and general appearance is not unlike black cherry of North America.

For all inside building uses, especially for flooring, *rauli* is a valuable material, and in its abundance in regions cut within the last 40 years it has been a controlling factor in competition with imported woods. Its greatest drawback has been that it goes to market only partly conditioned and is as difficult now as in the past to procure dry.

Coigue.—*Coigue* is distinguished by its height; usually it towers over all other Chilean forest trees. It is readily recognized by its persistent green foliage throughout the winter. If the heart is dark reddish, the wood is considered durable and so closely resembles the *roble pellin* that it goes to market mixed with it. On the other hand, if the heart is yellowish pink, as is most usual, the wood is scarcely merchantable as lumber, for it is noticeably destructible when exposed, while for inside uses it is too hard, heavy, and susceptible to checking. It is the least valuable and probably the most abundant of all the beeches in the lumber region of Chile. The lumbermen leave a majority of the *coigue* standing, except when cutting for firewood.

Laurel.—The laurel (*Laurelia aromatica*) is another handsome

tree of large proportions. It stands in abundance mixed with the beeches and contributes to the exceptional beauty of Chilean forests. The tree is widely known and favored because of its fragrant leaves. Its wood of variable shades is usually an olive hue, fairly soft, easily worked, and lighter in weight than any other of Chile's common lumber woods. It checks and twists in drying. This wood, plentiful and adaptable, blocks the importation of American box shooks. Doubtless over 75 per cent of all laurel cut in Chile furnishes material for the box makers. The better grades are used to a limited extent for ceiling and flooring instead of rauli and Douglas fir, because they are cheaper than the latter. There is another species of laurel, very abundant toward the south, that is locally referred to as the huahuan (*Laurelia serrata*). It is said to be of little value as a lumber tree. The wood has a disagreeable odor.

Lingue.—Lingue holds primacy among the native woods for cabinetmaking, furniture, and fixtures. Its conspicuous pith rays give it somewhat the appearance of American white oak and in its commercial uses it may properly be called the oak lumber of Chile. The wood, usually light yellow, is handsome when given a natural finish, but the heartwood is variable in shade and difficult to match; therefore much of it can be used only by staining. The lingue tree is not particular as to soil or location. It is found growing from high mountains to situations near the sea, in swamp lands, and also on well-drained locations. It is the bark of this tree that is most sought after for tannin and to a limited extent exported to Europe. Vast quantities of the lingue timber have been and are being destroyed through being left in the woods to rot. It is frequently felled in remote places only for the bark.

Ulmo.—In blossom the ulmo is the dogwood of Chile. The spring brings forth prolific bloom of large white flowers, which present an aspect of rare beauty. The wood of the tree, strong, very close-grained, hard, and not difficult to work, makes excellent flooring, which is its most exacting use in southern Chile. It is abundant south of the present principal lumbering region, and is therefore not common on the markets. Ulmo is not durable exposed, but in the nitrate district, where there is no rain, it is in demand, and because not given to checking, is preferred to roble pellin for crossties and telegraph poles. The Indians seek large ulmo trees for making the best dugout canoes.

Luma.—From its properties and uses the luma may be properly called the hickory of Chile. Noted for its hardness, strength, weight, and flexibility, it is called on most for tool handles, vehicle parts, gymnasium apparatus, etc. The wood burns long and with an intense heat and is therefore appreciated above any other tree for fuel purposes. Steamboats in south Chile demand it for this purpose in large quantities.

Alamo.—Years ago the alamo tree was brought from Spain and planted on farms in the central region of Chile. Its adaptability to Chile's climate and soil, determined by its phenomenal growth, caused these trees to be planted for fuel (chiefly for household use), and to be set out close together (16 to 24 inches) in rows, for marking property lines and for field fences, because of the high cost of the customary abode fence. Trees soon attained merchantable size,

and it was not long before the farmers discovered a surplus supply of logs and began to look for a market for this poplar. An abundance of lumber was to be had from indigenous trees, but the southern woods, the beeches and laurel, because difficult to season and susceptible to seasoning defects, could rarely be procured conditioned and could not be put in place green. Alamo was free from these objections, was the closest of all timber to the market, and was reasonable in price. It sells for about half the price of Douglas fir. To-day alamo contributes approximately 2,000,000 feet of marketable lumber to Chile's lumber supply, and, besides, in small-size bolts, serves for match and pulp manufacture. Poplar lumber is found in all markets in the Republic from Iquique to Concepcion. In meeting uses for interior construction, chiefly ceilings, it considerably affects the demand for Douglas fir.

The alamo of Chile is the common poplar tree of the United States, readily recognizable by its erect, tall, slender, and slightly pyramidal shape and sometimes called North Carolina poplar. The botanical name in Chile, as in Spain, is *Populus pyramidalis*.

SOFTWOODS.

Although Chile has a number of coniferous woods, only four offer any possibility of commercial importance—alerce, manío, Chilean pine, and cypress.

Alerce.—The common name in Spanish implies that this tree is a larch, but botanically it is not so classified. The lumber, rarely found on the market, is the most valuable wood in Chile. Possessing a reddish tinge and numerous fine growth rings, its general aspect resembles sequoia (California redwood); on cross section the sharp contrast of the dense, darker-colored wood of the annual rings gives the structure an appearance not unlike that of slow-growing virgin long-leaf pine (*Pinus palustris*).

Although resinous, the wood is soft, light, and workable, like Minnesota white pine, but it is not as strong nor as tough as the latter. Cleavability is another distinguishing feature of alerce, which, together with its durability, accounts for its excellence for roofing, though at present it is only occasionally used for this purpose. The natives in early times made split shingles of the heart-wood. In south Chile alerce roofing was shown which in this very humid climate was alleged to have been in service 60 years.

Alerce can be seasoned more easily than any other Chilean wood. Shrinkage is slight and the wood is free from checking and warping. In place, therefore, it is remarkably stable. Sash and doors made of this wood bring the highest price. In the limited quantities in which alerce appears on the market it goes into furniture, fixtures, and interior trim. Where wood is used outside, infrequently, for cornices, parapets, and porticoes, it is preferred to all other Chilean lumber. Alerce is perhaps the senior tree of the Chilean forests. The age of several specimens, determined by counting the annual-growth rings, is said to have been more than 4,000 years. Although of slow growth, the alerce tree is usually of merchantable size, often of very large diameter, and of great height. It is infrequently found in patches of homogeneous stands in bottoms and low and inundated lands south of the Valdivia River, on the Island of

Chiloe, and in the Province of Llanquihue. Relatively it is not plentiful, and many of its stands are to be found in inaccessible places. It is therefore the highest-priced native lumber wood in Chile.

Chilean pine.—Like alerce, Chilean pine is accorded a reputation on the east coast of South America northward to Rio as holding great possibilities of gaining in South American markets considerable commercial importance as a lumber wood. Botanically it is an araucaria (*Araucaria imbricata*) and a relative of Parana pine (*Araucaria brasiliensis*). It seeks high elevations, even in the neighborhood of snow-capped peaks. The best-proportioned trees are to be found at elevations from 4,000 to 6,000 feet; the tree in smaller sizes ranges as far down as 3,500 feet. Like alerce, Chilean pine is usually found in patches of homogeneous stands. It doubtless derived its name from the Araucanes, the Indians originally occupying southern Chile, or from the country's former name, Araucania. The Indians and many natives continue the custom of annual pilgrimages to the mountains to gather for food the large seed "piñones" that fall from the araucaria's cones in the month of March. These seeds constitute an article of commerce and are retailed in Santiago at 18 to 22 pesos (\$3.11 to \$3.80) per sack of 50 kilos (110.23 pounds).

The wood, nonporous, of a light creamy color, flexible, strong, easily worked, is remarkably free from imperfections. Its fine texture resembles none of the other pine woods of commerce. It is considerably heavier than Douglas fir and is difficult to season, not durable, and of doubtful stability. The wood as lumber has little adaptability and is high-priced when occasionally found in the markets. The logging difficulties connected with its otherwise expensive exploitation further remove the araucaria as an important lumber wood, even in Chile. Certainly it will never supplant Oregon pine. Chilean pine has recently been demonstrated as valuable for wood pulp, for which it will doubtless be most utilized.

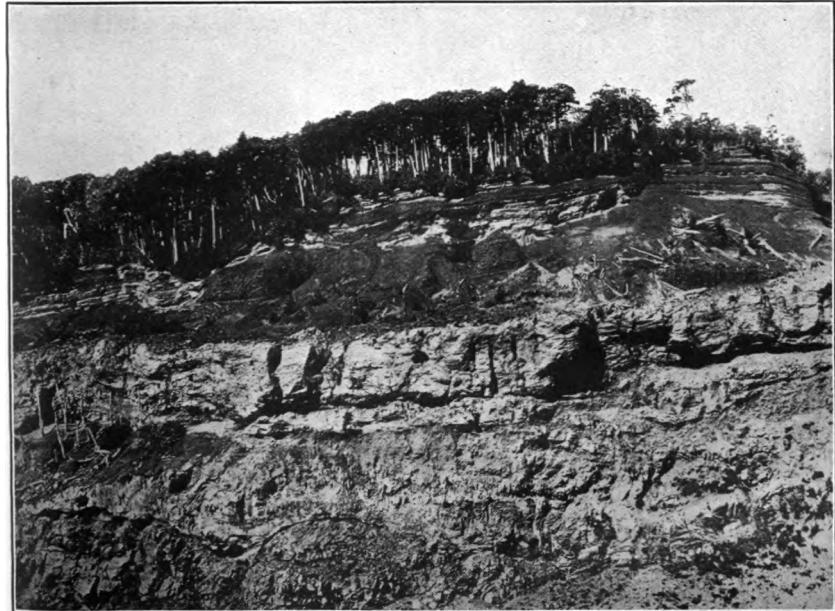
Maño.—This light-yellow softwood is not dissimilar in general appearance to araucaria wood, though softer, lighter, and less resinous. It is highly appreciated in the south for doors and blinds, interior work, and general uses, being cheaper than alerce. It is not found on the market in the central region, but is shipped in limited quantities to northern Chile, cut into 6 by 6 sizes, for telephone and power-transmission poles, and also in the form of boards and planks. If maño were abundant, it would have possibilities for gaining considerable economic importance in Chile, but its range is limited and its stands generally scattered.

Cypress.—There are two species of cypress. Chilean cypress (*Libocedrus chilensis*) grows in elevated situations in Provinces from Santiago south to Valdivia, and cypress of the Guaitecas (*Libocedrus tetragona*) south of the Valdivia River. The latter is most abundant on heights in the Guaitecas Archipelago. These trees are of the same family as California white cedar, known more widely as incense cedar, which has recently been utilized as a practical substitute for American red cedar as a lead-pencil wood.

Its remarkable and attractive pyramidal shape makes the cypress conspicuous and easily identified. Neither variety attains great height, but the trees are fairly large in diameter, which ranges not

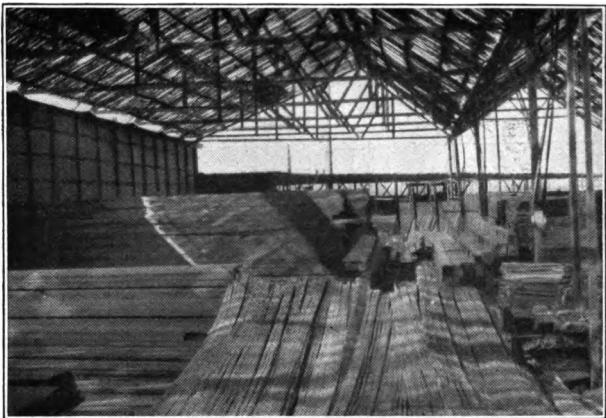


1. TYPICAL SPECIMENS OF CHILEAN PINE.

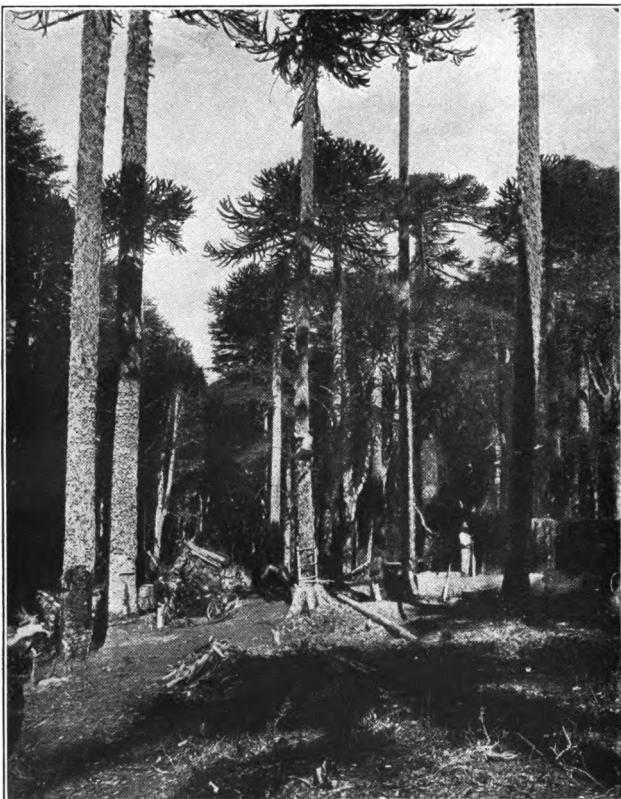


2. A CHARACTERISTIC STAND OF CHILEAN PINE (ARAUCARIA).





3. SPLIT BAMBOO FROM ECUADOR USED FOR ROOFING IN RAINLESS REGIONS OF CHILE. THE TOP OF A PILE IN STORAGE ALSO SHOWS IN THE FOREGROUND.



4. FOREST SPECIMENS OF CHILEAN PINE.

infrequently from 18 to 36 inches. Two factors that will probably prevent cypresses from becoming important lumber trees are a prevalence of knots in the wood and the high cost of extraction from their habitat high on mountain sides. The wood is aromatic and of noted durability in contact with the soil, and in general appearance, except for the dark-colored heart, is not unlike American spruce. Though more costly than other native kinds, this wood is most suitable for fence posts, telegraph poles, pier foundations for buildings, etc. The lumber appears in the markets of Chile in very limited amounts in scantling form, usually hewed for rafters.

Chapter III.—DIVISIONS OF THE LUMBER INDUSTRY.

There are two divisions of the lumber industry in Chile: (1) Production of native lumber and forest products, and (2) importation and distribution. Fractional distillation for making wood alcohol, acetates, etc., was a specialty, but this branch of the industry was recently suspended for an indefinite period. Coniferous woods are cut in Chile, as in Brazil, but they are not separately manufactured; the mills sawing them also produce greater quantities of hardwood lumber. Crossties, poles, and posts are the products of the same sawmills as lumber.

Several species in Chile's forests are noted for their high tannin content (principally lingue, ulmo, and canelo), and bark peeling is extensively carried on. The operations are necessarily confined to a limited period of the spring season and are conducted by the mill owners incidentally to lumbering. The production of charcoal is another important operation of the wooded regions, for throughout the Republic houses are constructed without flues or chimneys, and charcoal burners furnish the principal heating facilities. The universal type of charcoal kiln is an earth-covered oval pyramid, into which small pieces of wood are piled. The species most in demand for charcoal are espino, lima, tiaca, teniu, pelu, meli, and tepu, because, it is claimed, they are productive of a charcoal combustible with great heat but without gas or flying sparks, and leaving only a small percentage of ashes. Next to tan and soap barks, charcoal is the forest product entering most largely into export.

The operations undertaken by farmers, lumbermen, and rural laborers do not constitute a distinct pursuit, only a side line, worked during the rainy season, when other activities have to be suspended.

PRODUCTION OF NATIVE LUMBER.

METHODS OF LUMBERING.

Methods of lumber production in Chile are different from those of other South American countries, where the cut is largely by urban mills. Practices are similar to those in the hardwood regions of the eastern United States. The type of machinery most commonly used is the portable sawmill with a capacity of 2,000 to 8,000 feet, board measure. American-made mills are preferred and are most seen. Operations consist in chopping down and sawing stands containing about 200,000 to 600,000 feet, log scale. They are called "sets," which differ in area according to quality of timber and to logging conditions. When one set is exhausted, the mill is removed to a location closer to uncut timber.

Only a few companies or corporations and still fewer individual operators specialize in lumber production. Chilean farmers, proprietors of the "fundos," the landed estates, or camps, of immense areas, are the principal lumber producers. Lumbering is only an important department conducted and managed in connection with regular agriculture operations. Not infrequently these large farms with advantageous timber stands are rented. The rental is paid annually in money and the terms of the lease give the tenant the right to cut and remove as much timber as he can manufacture within the period of the lease. The few independent mill owners and companies largely operate in this way.

EXPENSE OF PRODUCTION.

Logging in Chile is paid both by wages, as when the labor is performed by farm hands using the teams of the farmer, and by contract at a certain amount per diameter inch of logs laid down at the mill, the rate charged varying according to distance, topography of the tract operated, and quality of the stand. There are natives with bullock teams that specialize in contract logging and also haul finished lumber from mill to rail siding, to river landing, and sometimes to port cities. Because of the rough surface conditions for logging and poor country roads for hauling lumber, all carts in Chile are drawn by oxen. The two-wheel ox cart is used for both logging and hauling lumber wherever practical, but frequently, because of rough and precipitous situations, the logs have to be snaked for part of the distance. The range of costs for placing logs at the mill is about 8 to 16 Chilean paper pesos per 1,000 feet (\$1.38 to \$2.76 American gold). Mill expenses in connection with manufacture amount to a probable range of 8 to 12 pesos (\$1.38 to \$2.07) per 1,000 feet. This puts the cost of lumber at the mill at \$2.76 to \$4.83.

It is difficult to value stumpage because timber land is not bought and sold separately, only incidentally to the farms. A lumberman rents large estates, mainly for timber privileges. One operator, careful in cost keeping, values stumpage under conditions of this character at 2 to 2.80 pesos per tree, putting 600 feet, log scale, as the average size tree cut. This would amount to an approximate average stumpage cost of 40 centavos for 100 feet, or \$0.69 per 1,000 feet. The expense of hauling boards, etc., to the station, when done by contract, is commonly 2 pesos (\$0.35) per league (nearly 3 miles). At present, with the growing scarcity of timber, many mills are operating far inland from railroad or steamer port, so that the distance of the average haul may not be far from 10 leagues, which at 2 pesos per league would equal 20 pesos (\$3.45) per 1,000 feet piled at the station. The production cost may therefore be approximated as follows: Stumpage, \$0.69 per 1,000 feet; logging, \$2.10; manufacture, \$2; hauling to station, \$3.45; loading, \$0.45; total, \$8.69.

MARKETING METHODS.

Lumber is usually marketed through lumber dealers; but it is also sold by brokers and sometimes direct to mines, factories, etc. The terms of sale usually include delivery stuck-piled at the nearest railroad station. The material is measured by the purchaser as it

is being piled; afterwards the purchaser labels his name on all sides of the stack. The pile often remains as long as two and three years for air-drying before it is loaded for market. The most common of all native woods, roble, is not held in stack, but is handled in commerce preferably unseasoned, and when stacked is always close-piled to prevent drying, because of its susceptibility to deterioration by checking.

The system of lumbering as an operation incidental to farming has been prejudicial to the marketing of Chilean woods. Lack of system and practical supervision and the need of skilled sawyers have caused large quantities of poorly manufactured and unnecessarily low-grade lumber to be thrown on the market. This condition has depressed prices and doubtless accounts for many of the sawmill failures. A greater difficulty has been the attempt to market hardwoods unseasoned or partly seasoned. Farmers' operations on a small scale include no facilities for artificial drying; except that a few small kilns of primitive type are operated in connection with the manufacture of furniture or sash and doors, kiln-drying is unknown in Chile. Furthermore, proper piling methods have received little, if any, attention, and the loss by deterioration from this cause is said to be often as much as 25 per cent in a single stack. The lumber region of Chile has practically continuous rainfall for over eight months, and it takes over twice as long to dry hardwoods in south Chile as in any part of the United States.

IMPORTATION AND DISTRIBUTION.

CHILE'S TOTAL LUMBER CONSUMPTION.

Exclusive of the quantity of forest material required in the Republic for rough products (crossties, telegraph and telephone poles, fence and vineyard posts, mine or pit props, firewood, charcoal, distillate products, tan bark, etc.), Chile's lumber consumption approximates annually 80,600,000 feet board measure, valued at \$2,170,500, of which domestic woods supply 36,500,000 feet (45.3 per cent), valued at \$840,000; the United States, 43,725,000 feet (54.2 per cent), valued at \$1,311,750; and all other countries, 375,000 feet (0.5 per cent), valued at \$18,750. In addition, Chile pays fairly large amounts for American tight cooperage stock, naval stores, and wood pulp.

The import figures show an average for three years based both on records kept by prominent practical lumbermen and importers, and on statistics of the Chilean Government. The lumbermen claim that the Government statistics show inaccuracies resulting probably from the necessary change in the basis of quantity from board feet to square meters, a rather complicated computation that has to be worked out by a number of officials at the various ports and affords great opportunities for error. The quantity of lumber imported according to official records was for several years 25 per cent more than the quantity claimed by any of the business houses. Several private records of competing firms, though they showed some disagreements among themselves, were much closer to one another than was any one record to the official figures. The figures given, therefore, represent the average of two private records and the Government statistics.

No institution in Chile, private or governmental, is concerned in the compilation of statistics of lumber production. It was not possible to obtain a report from each of the 1,000 Chilean sawmills. The figures given represent the carefully prepared estimates of 12 lumbermen of recognized prominence and experience operating as producers, brokers, or dealers in various localities.

The stated valuation of imported lumber is considerably higher than the equivalent record shown by the Chilean customhouse statistics. For the purpose of customs charges, fixed arbitrary values, according to classes, are given to various import commodities. For instance, pine lumber, which is construed to include all coniferous woods, has one valuation, although the prices of white pine, sugar pine, and redwood are higher than those of Douglas fir, spruce, and Scotch fir. The hardwood classification presents a similar situation. Average c. i. f. prices were therefore substituted for the Government valuation.

The fluctuating Chilean paper peso has been changed to American currency throughout this report, at the rate of $17\frac{1}{4}$ cents to the peso. Chilean gold is valued at 18 pence (\$0.365). Computations for this report changing English to American money have been made in terms of normal values (1 pound sterling = \$4.8665).

A fact of considerable interest is that no part of Chile's lumber supply comes from other South American countries. Ecuador sends only split bamboo, used to a limited extent for roofing in the rainless region. Of the imports cut in forests of foreign countries, North America has furnished 99 per cent. Notwithstanding the reputed value of Chilean broad-leaf and coniferous woods, the relation of the cut of native woods to the total lumber consumption is less than that shown by similar figures for Brazil. On the other hand, it is almost four times the proportion shown for Argentina.

IMPORTS AND PRODUCTION, BY KINDS OF WOOD.

The following table shows the imports and domestic production of various kinds of wood in 1912, 1913, and 1914:

Kinds of wood.	1912	1913	1914
IMPORTED.			
Douglas fir.....	47,211,000	48,486,000	38,322,000
White pine and sugar pine.....	1,330,000	1,500,000	974,000
White and red oak.....	481,000	102,000	384,000
Ash, poplar, elm, etc.....	249,000	98,000	167,000
Furniture woods ^a	104,000	39,000	89,000
Total imported.....	49,375,000	50,225,000	39,936,000
DOMESTIC.			
Roble pellin.....	11,000,000	8,895,000	3,100,000
Rauli.....	8,800,000	6,560,000	2,400,000
Lingue.....	4,400,000	3,000,000	1,100,000
Laurel.....	7,920,000	5,800,000	2,160,000
Coigüe.....	5,280,000	1,240,000	1,440,000
Alerce.....	760,000	500,000	280,000
Alamo.....	2,400,000	2,310,000	450,000
Chilean pine, etc. ^b	4,340,000	3,095,000	1,320,000
Total domestic.....	44,900,000	31,200,000	12,250,000
Grand total.....	94,275,000	81,425,000	52,186,000

^a Quartered oak, black and French walnut, birch, and mahogany.

^b Mañío, ulmo, cypress, canella, luma, roble de Chiloé, etc.

IMPORTS AND PRODUCTION, BY PORTS.

Until the outbreak of the European war the quantities of lumber imported into Chile were on the increase. In north Chile it has not been many years since domestic lumber was rarely used except for crossties; American woods alone supplied the demand. In the northern part of the central region, including Valparaiso, the home-grown woods were relatively uncommon, but not so uncommon as were the foreign woods in markets of south Chile. To-day lumber from the two sources meets in competition in nearly all the markets. The importance of imported and domestic woods is shown by market regions in the following table, which includes data for the calendar years 1912, 1913, and 1914 for imports, and for a year considered as normal (1913) for domestic lumber.

Ports.	Imports.						Domestic production.	
	1912		1913		1914			
	Feet.	Value.	Feet.	Value.	Feet.	Value.	Feet.	Value.
Arica, Iquique, etc.....	7,625,000	\$218,000	10,100,000	\$270,000	8,120,000	\$232,000	1,550,000	\$28,300
Antofagasta.....	12,942,000	355,000	18,060,000	488,000	14,546,000	402,000	1,740,000	38,000
Talcahuano.....	3,200,000	84,000	4,100,000	120,000	2,500,000	67,500	.....	.....
Coquimbo.....	2,130,000	57,000	1,820,000	49,000	1,580,000	43,200	750,000	18,750
Vaiparaiso-Santiago.....	22,900,000	620,300	15,915,000	480,000	12,975,000	377,800	16,560,000	597,000
Concepcion and ports south.....	578,000	17,800	230,000	8,600	215,000	6,350	10,800,000	239,000
Total.....	49,375,000	1,352,100	50,225,000	1,415,600	39,936,000	1,128,850	31,200,000	921,050

The depression in the lumber business resulting from the war and the general commercial crisis experienced in South American countries in 1914 did not affect lumber imports into Chile nearly as much as it set back national production. When the depression set in the buying of American lumber stopped, but contracts made months in advance, which are necessary in lumber importation, were too far on the way to be recalled. Towards the end of 1914 and beginning of 1915, the lumber demand went down below anything before experienced by the trade; the figures for the 1915 imports will therefore show considerable reductions from those for 1914. At the time of the crisis there were abnormal stocks of domestic lumber on hand, in fact an overproduction at the mills and with dealers. Practically all manufacture, therefore, was stopped. Stocks have since been moved slowly and at much reduced prices. It is said that one of the largest jobbers interested in native lumber, owing to the great shrinkage in the value of domestic woods and the deterioration resulting from having large stocks of green material on hand, was compelled, after eight months, to charge off on his books 1,000,000 pesos (\$172,500) to loss and depreciation.

In every market in north Chile the consumption of imported lumber, principally of American production, is greatly in excess of the consumption of native wood, although domestic lumber is brought to these parts and sold at much lower prices. In general construction the foreign woods are preferred, because domestic lumber is poorly conditioned and cut to sizes relatively inconvenient. The consumers in north Chile are largely the ore-mining and the nitrate

corporations. While considering economy, they are also discriminative as to wood properties. In the thickly populated central region, where the large cities, including Santiago and Valparaiso, are located, the consumers are usually more influenced by first cost, and the lower-priced native lumber is consumed in greater amounts than elsewhere in Chile. Even in this section, however, imported woods are in almost as much demand as domestic lumber, in spite of higher prices. It seems apparent, therefore, that common Chilean lumber woods, on a basis of utility, can not compete, even at home, with strong, soft, workable lumber such as is cut from conifers in the United States.

The foregoing table shows the markets of "Concepcion and ports south" grouped under one heading. The markets of this part of the Republic are those on the frontier that have not yet developed to considerable importance. Located as they are in the lumbering region, their lumber demand, which is not varied, is met almost entirely by native woods. Imported woods, however, are to be found in the stocks of this region; they are received and sold in small quantities from time to time in several of the southern markets. Foreign softwoods and hardwoods are standard in Concepcion and Punta Arenas. The latter market is distinct as the only one in Chile where European lumber is most in demand and outclasses in importance both American and native woods.

The trend of Chile's lumber imports from foreign countries for the last 10 years, although fluctuating, has been decidedly upward. The importance of this fact is greater when it is considered that these years constitute the period of Chile's largest lumber production and lowest prices; the time when virgin stands of the best marketable species were plentiful, close to transportation facilities, and not far from the principal consuming markets. To-day the center of production is 175 miles farther distant.

IMPORTS AND PRODUCTION, BY KINDS OF WOOD AND PORTS.

The extent and character of the lumber requirements in the various markets of Chile, according to the quantity annually handled and the kinds of wood, are shown in the following table. The information is given only for the year 1913, but, according to local opinion in lumber circles, this shows the normal distribution of native and imported woods in Chilean markets. The table is useful in noting the relative rank of the various cities in lumber consumption and the comparative importance of various kinds of wood in the several industrial markets. Northern Chile ports show relatively large quantities of native woods under the item "all other," because species like mañío, ulmo, cypress, and luma, brought from the fifth zone in the south, are woods that as yet appear infrequently in the principal markets.

Kinds of wood.	Santiago.	Valpa-raiso.	Concep-cion. ^a	Coquim-bo.	Anto-fagasta.	Iquique. ^b	Total.
IMPORTED.							
Douglas fir.....	6,781,000	Feet. 8,135,000	Feet. 204,000	Feet. 1,820,000	Feet. 17,645,000	Feet. 14,001,000	Feet. 48,480,000
White pine and other conifers.....	350,000	540,000	100,000	.....	360,000	150,000	1,500,000
Oak and other American hardwoods.....	54,000	40,000	75,000	15,000	35,000	20,000	230,000
Total imported.....	7,185,000	8,715,000	379,000	1,835,000	17,940,000	14,171,000	50,225,000
DOMESTIC.							
Roble pellin.....	3,400,000	1,600,000	3,075,000	120,000	300,000	400,000	8,895,000
Rauli.....	2,800,000	1,200,000	2,000,000	160,000	200,000	200,000	6,560,000
Lingue.....	1,500,000	550,000	650,000	50,000	150,000	100,000	3,000,000
Laurel.....	1,300,000	900,000	2,300,000	200,000	500,000	400,000	5,600,000
Coigüe.....	400,000	200,000	640,000	(d)	(d)	.....	1,240,000
Alerce.....	100,000	.....	400,000	.....	.....	.....	500,000
Alamo.....	1,210,000	400,000	200,000	100,000	250,000	150,000	2,310,000
All other.....	640,000	360,000	1,335,000	120,000	340,000	300,000	3,095,000
Total domestic.....	11,350,000	5,210,000	10,600,000	750,000	1,740,000	1,550,000	31,200,000
Grand total.....	18,535,000	13,925,000	10,979,000	2,585,000	19,680,000	15,721,000	81,425,000

^a Includes Temuco, Valdivia, Punta Arenas, etc.

^b Includes Arica, Tocopilla, Taltal, Caldera, etc.

^c Mixed with coigüe.

^d Mixed with roble.

SPECIES OF IMPORTED LUMBER.

SOFTWOODS.

Douglas fir.—That Chilean lumber consumers prefer Douglas fir to any other wood is shown by its consumption in greater quantities than any other lumber sold in Chile, and by its demand for a greater number of uses than any other wood, domestic or foreign, found on the markets of the Republic. For a considerable period Douglas fir has constituted over 90 per cent of the lumber imports. To its valuable properties, which have been receiving growing recognition, and to the foresight and sagacity of the west-coast lumbermen in careful shipments of properly conditioned material can be credited the large volume of lumber trade that the United States has been able to control in Chile.

Douglas fir (*Pseudosuga taxifolia*) can be said to be related collaterally to the spruces or perhaps to the hemlocks. In the United States it is frequently called Douglas spruce, but the generally accepted name is Douglas fir. In Chile it goes into commerce everywhere as "pino de Oregon," or Oregon pine. The tree grows to exceedingly large proportions. Its habitat is the western United States, where it ranges over vast areas, often in unmixed stands, as high as 10,000 feet above sea level.

The rumor current in Chile, and important in that it has been printed in official publications of the Chilean Government, that the virgin timber supply of Douglas fir is nearly exhausted, that only the cut of a relatively few years remains, and that the lumber is being cut in increasing quantities for small and lower-grade logs, is without the slightest foundation. American lumbermen should take every possible occasion to correct it. Gray's Harbor, Willipa Harbor, and Puget Sound are the ports of clearance for a majority of Douglas-fir cargoes coming to Chile. Shipments from the Columbia River sec-

tion also have been received. Importers generally expressed no preference for material cut in any one region.

Yellow and white pine.—Southern yellow pine, the most extensively used wood in the countries of the northern and eastern coasts of South America, is not a standard on the markets of Chile. It is imported for particular purposes that require a wood with great strength and durability under exposure, combined with relatively light weight and workableness. The Chilean Government, principally the Navy, in its work of naval construction and repairs, is the largest user of this wood. The car builders infrequently demand small quantities, and its appearance in homemade furniture indicates another minor market. The wood is usually termed "pino amarillo," or yellow pine.

The white-pine supply is the product of Canada and the United States. It is called locally "pino blanco." The pine cut in Canada comes to Chile via New York in small and occasional parcel consignments, and arrives usually in plank form to meet part of the demand for pattern stock. The part of the supply originating in forests of the United States is sugar pine from California. Except for a few consumers who regard the Eastern wood (*Pinus strobus*) as superior, sugar pine (*Pinus lambertiana*) has supplanted the Canadian product. Like the eastern wood, sugar pine is bought almost exclusively for foundry models, patterns, and templets, but is used to some extent in house finish and shop buildings. In sash and door manufacture, except for a few doors made by nitrate plants (oficinas) for their own use, the white pines are not demanded even for panels nor do they take an important part in any products manufactured by wood-using industries.

Redwood.—Lumber cut from the California redwood (*Sequoia sempervirens*) has been shipped to Chile and is highly regarded for its softness and its workable and durable qualities, but it is not kept regularly in stock in any of the markets, owing, it is said, to its high price. The Chileans call the wood "pino colorado," or red pine. Redwood is similar in shade to the native roble and rauli; the color, therefore, is an advantage in marketing the wood in Chile. In Antofagasta it answers for foundry patterns. A recent innovation is the use of stave water pipes made of redwood in connection with irrigation projects and contracting work. It is favorably recommended, and the resumption of normal conditions should produce considerable business.

Northern pine.—Northern pine (*Pinus sylvestris*), sometimes called Swedish pine and Scotch fir, is the principal European wood marketed in Chile. It comes principally via England and finds its greatest demand in the extreme southern port of Chile, Punta Arenas, where it is the most important lumber entering into trade. There are two reasons for this importance: First, steamship lines from England to Valparaiso and Callao call regularly at Punta Arenas and can bring lumber at cheaper rates than those on soft-woods from North America; secondly, the principal competitors of Baltic pine in these markets are roble Magallanes and maiten (*Maytenus boaria*). These woods are plentiful in near-by stands and are sold comparatively cheap, but neither of them makes anything but the most indifferent lumber. They are subject to excessive checking, are

heavy and difficult to season, and are unstable and perishable. Ulmo and cypress of the Guiatecas are brought to Punta Arenas in limited quantities from the Island of Chiloe, but they come unseasoned and in other respects are less desirable lumber than the accurately manufactured and well-conditioned Scotch fir.

HARDWOODS.

Oak.—American hardwoods are brought to Chile in limited quantities for particular uses, such as furniture, naval construction, vehicle building, and car construction. White oak (*Quercus alba*) and red oak (*Quercus rubra*) are called “roble Norte Americano.” The furniture manufacturers make no distinction between them, but they are not satisfied with either and state their preference for the higher-priced, but always satisfactory, European oak infrequently imported from Germany. Other users, like the Government, are particular in specifying white oak. They also are dissatisfied, claiming that Americans ship mixed oaks in filling orders. This wood is said to cause more controversies than any other wood imported into Chile. The recent receipt of small shipments of Japanese, or Manchurian, oak offered at lower prices than the American wood is important and should receive the attention of American hardwood lumbermen. It may be the beginning of a situation similar to that in Argentina, where the Japanese wood, though not as well regarded as the American oak, has been gradually supplanting the latter because the oriental product is delivered better conditioned and more consistent as to color and grade.

Ash.—This wood, called fresno in Chile, is the product of several species in the United States, which are commercially divided into white ash and brown ash, named after the two predominant varieties, *Fraxinus alba* (white ash) and *Fraxinus nigra* (brown ash or black ash). Both species are brought to Chile from the United States. The former, purchased to the largest extent by the Chilean Government and street-car companies for construction and repairs of various kinds, is preferred because of its great strength, stability, and light weight. The same qualities, together with hardness, commend this wood for the manufacture of gymnasium apparatus. The latter species, brown ash, is seen frequently in car finish and store fixtures and, to a less extent but commonly, as furniture in case goods, bedsteads, etc. In this latter use its pronounced and attractive grain and color in a natural finish are popular with classes that can not afford high-grade furniture.

Yellow poplar and other hardwoods.—Alamo Americano is the Spanish name employed in Chile for yellow poplar (*Liriodendron tulipifera*), which is imported in small amounts, mostly for vehicle bodies and panel repair work of railroad and trolley cars. It is called for especially in wide planks, and the width to some extent accounts for the high price. Small amounts of black walnut, sweet birch, black cherry, quartered oak, mahogany, French walnut, and other hardwoods are brought to Chile, principally for furniture.

DIMENSIONS.

Chilean lumber dimensions correspond almost exactly (except in certain imported lots of hardwood) to standards of the United States. Dimension schedules of imports, generally termed specifications, vary according to stock requirements or, if special, according to the intended application. American hardwoods are usually called for in special widths, which account in part for their high price. Because consumers can secure Oregon pine in desired sizes and native boards in no widths less than 10 inches they can not be convinced that there is anything unusual in their call for wide-cut American hardwoods and are perplexed over costs. Many uses to which oak, ash, walnut, etc., are put do not justify the widths demanded. The importers generally have long been agreeable to changing specifications to narrower stock, but it is not a vital matter in their business, and it is doubtful whether the subject has been forcibly presented to the consumer.

Either Chilean trade is less discriminating as to the accuracy with which lumber is manufactured to prescribed dimensions, or the lumber coming to Chile is less faulty in this regard than is the American product secured by countries of the east coast of South America. Not a single complaint was heard in any Chilean market in this connection.

There is no peculiarity in the dimensions of lumber manufactured in Chile, except the limited range of sizes. Doubtless 60 to 65 per cent of the lumber manufactured in Chile is of a single size, 1 by 10 inches by 12 feet. The principal exception is roble, which, because of its general use for structural work, is marketed partly in scantling dimensions. Another exception is farm-grown alamo, cut in boards $2\frac{1}{4}$ to $4\frac{1}{4}$ inch thick and 7 to 8 or, infrequently, 4 to 6 inches wide.

The following table shows the customary dimensions of the principal woods on the Chilean market:

Kinds of wood and dimensions.	Kinds of wood and dimensions.	Kinds of wood and dimensions.	Kinds of wood and dimensions.
DOUGLAS FIR, MERCHANTABLE.	DOUGLAS FIR, SELECT.	RED AND WHITE OAK, FIRSTS AND SECONDS, NO. 1 COMMON.^b	LINGUE, FIRSTS AND SECONDS—contd.
4/4 by 8" by 14-32".	4/4 by 8" by 12-14".	4/4 by 8-10" by 12' up.	10/4 by 10" by 12'.
4/4 by 10" by 14-32".	4/4 by 6" by 16-32".	6/4 by 8-10" by 12' up.	12/4 by 8-10" by 6-12'.
4/4 by 12" by 12-14".	6/4 by 6" by 12-14".	8/4 by 8-10" by 12' up.	4 by 5" by 12'.
4/4 by 12" by 16-32".	6/4 by 6" by 16-32".	12/4 by 8-12" by 12' up.	4 by 5" by 16'.
5/4 by 12" by 16-32".	6/4 by 8" by 12-14".	16/4 by 8-12" by 12' up.	4 by 10" by 12'.
6/4 by 12" by 16-32".	6/4 by 8" by 16-32".		4 by 10" by 16'.
6/4 by 10" by 14-32".	6/4 by 8" by 16-32".		4 by 6" by 16'.
6/4 by 12" by 12-14".	6/4 by 12" by 12-14".	TEAK.	4 by 10" by 12'.
6/4 by 12" by 16-32".	WHITE AND SUGAR PINE, FIRSTS AND SECONDS, CLEAR PATTERN.	3 by 4" by 18' up.	5 by 6" by 16'.
8/4 by 3" by 12-14".	4/4 by 10-18" by 12-18".	4 by 4" by 18' up.	5 by 7" by 7'.
8/4 by 3" by 16-32".	5/4 by 10-18" by 12-16".	4 by 6" by 18' up.	5 by 12" by 12'.
8/4 by 4" by 12-14".	6/4 by 10-18" by 12-16".		5 by 12" by 16'.
8/4 by 4" by 16-32".	8/4 by 10-16" by 12-18".	WHITE AND BROWN ASH, FIRSTS AND SECONDS, NO. 1 COMMON.	6 by 10" by 12'.
8/4 by 6" by 12-14".	10/4 by 10-16" by 12-16".	3/4 by 10-12" by 12' up.	6 by 12" by 12'.
12/4 by 4" by 12-14".	12/4 by 12" by 14-16".	10/4 by 10-12" by 12' up.	6 by 12" by 16'.
12/4 by 4" by 16-32".	16/4 by 12" by 12-16".	12/4 by 8-18" by 12' up.	
12/4 by 6" by 14-32".		14/4 by 8-12" by 12' up.	
12/4 by 8" by 12-14".	YELLOW POPLAR.	16/4 by 8-10" by 12' up.	
12/4 by 8" by 16-32".	4/4 by 10" by 12' up.		
12/4 by 8" by 34-40".	4/4 by 12" by 12' up.	BLACK WALNUT.	
12/4 by 10" by 12-14".	4/4 by 16" by 16' up.	4/4 by 6-10" by 12' up.	
12/4 by 10" by 16-32".		6/4 by 6-10" by 12' up.	
12/4 by 10" by 34-40".		8/4 by 6-10" by 12' up.	
12/4 by 12" by 12-14".	SOUTHERN YELLOW PINE, LONG-LEAF, MERCHANTABLE, EXPORT.		
12/4 by 12" by 16-32".	4/4 by 6" by 12-22".	RAULI, FIRSTS, SECONDS, AND THIRDS.	
12/4 by 12" by 34-40".	4/4 by 8" by 12-22".	3/4 by 10" by 12'.	
5 by 5" by 16-32".	4/4 by 10" by 12-22".	4/4 by 4" by 12'.	
6 by 6" by 16-32".	6/4 by 6" by 12-22".	4/4 by 6" by 12'.	
6 by 6" by 34-40".	6/4 by 8" by 12-22".	4/4 by 10" by 12'.	
6 by 8" by 16-32".	8/4 by 8" by 12-32".	6/4 by 10" by 12'.	
6 by 10" by 16-32".	8/4 by 10" by 12-32".	8/4 by 10" by 12'.	
6 by 12" by 14-32".	8/4 by 12" by 12-32".	12/4 by 10" by 12'.	
8 by 8" by 14-32".	4 by 8" by 18-42". ^a		
8 by 8" by 34-40".		LINGUE, FIRSTS AND SECONDS.	
8 by 12" by 14-32".	ROCK ELM.	4/4 by 10" by 12'.	
10 by 10" by 16-32".	8/4 by 6-10" by 12' up.	6/4 by 10" by 12'.	
10 by 10" by 34-40".	10/4 by 6-10" by 12' up.	8/4 by 10" by 12'.	
10 by 12" by 14-32".	12/4 by 6-10" by 12' up.		

• Decking.

• Also dimensions cut to order.

• Prime grade.

MEASUREMENTS.

Generally, the standard system of lumber measurements followed commercially in Chile may be said to be the American-English board measure. All imported lumber, equal to about half of the consumption, is bought and sold in terms of this method. The domestic woods are handled on a slightly different quantitative basis. Lengths are gauged according to the Spanish "vara," equal to approximately 33 inches or, more closely, to 836 millimeters. But the widths and thickness being measured in inches and the board foot taken as the unit, the system approximates board measure. Quotations on scantling and dimensions of native lumber are according to "el pie," the Spanish term for foot (board measure). Those of boards, deals, planks, etc., are in terms of the "standard board," meaning a piece 1 by 10 inches by $4\frac{1}{2}$ varas, considered in trade equal to 12 linear feet. A 2 by 10 inch plank is counted as two boards; and a 3 by 10 inch deal as three boards, etc. One hundred boards, equal to 1,000 feet, has the

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same standard importance. An exception in measuring boards domestically produced is that of alamo, which, in widths usually of 7 to 8 inches, is sold by the unit of "la carga," a bundle of 8 boards. The prices of "la carga" differ according to thickness (1, $\frac{3}{4}$, or $\frac{1}{2}$ inch).

By statute, weights and measurements according to the metric system have been established as the national standard in Chile. For lumber transactions, however, the trade has held to the board-foot method of measuring because it is considered simpler and more practical. The Government bases duty charges on lumber on the surface measure according to the metric system, and official lumber statistics are similarly compiled and printed. The Chilean Navy Department and the State Railways, however, specify and pay for their lumber purchases in terms of board measure or by the number of pieces of given sizes in inches and feet.

GRADING.

Native timber cut into boards is sold in three grades. The first two appear on the market separately and also in combination, firsts and seconds of nearly equal proportions and better. The classification, being developed by custom, has never been accurately defined except in the case of firsts, which are taken to be defect-free. Dimension lumber generally is not graded. Douglas fir in rough lumber comes to Chile mostly in two grades of the standard classification, "merchantable" and "select" (Export List of the Pacific Lumber Inspection Bureau). The former grade covers all sizes of the usual specifications, while the latter comprises almost altogether 1 by 6 inch strips. According to the opinions of importers and lumbermen in Chile, the experience of American grading of Douglas-fir imports into Chile, after many years, may be pronounced eminently satisfactory. Special credit is due to the west-coast manufacturers for the care with which they have maintained a standard of lumber quality in export shipments. Probably no factor has contributed more to the success of Douglas fir in Chile against the difficult competition of low-priced native woods.

The basis of the few complaints and occasional claims that have been made was the adulteration of grades and the sending of coarse or wide-grain material. Coarse, low-grade, spike-knot material, essentially common, was mixed with the usual merchantable grade. The point emphasized was that the percentage of the adulteration, always nominal (5 per cent or less), was too insignificant for a claim, but was sufficient in quantity to represent a considerable loss in an average cargo, and could not fail to be regarded as intentional.

The presence of too large a percentage of coarse-grain timber (wide-ringed, fast-grown, porous material) was not regarded so much as a cause of complaint because the export grading rules take no account of grain or growth; but it was suggested that the manufacturer be advised of the preference and appreciation of the Chilean trade for the denser, finer-grained, and close-ringed wood. A small quantity of coarse grain, such as is averaged in a majority of Douglas-fir cargoes, is expected; only when the proportion is above the general run is objection made.

Of the lumber in stock and of the several cargoes generally surveyed in course of discharge, none was illustrative of these complaints. The noticeable fact in the lumber unloading seen by the writer was the presence of a fairly large percentage of selects and a few clears. Those who stated that they had had occasion for complaint did not hesitate to acknowledge the receipt of cargoes frequently bearing a goodly mixture of uppers. This is further borne out by the general practice of selecting the best of certain sizes from the merchantable in cargoes and using it for sash and door stock and other planing-mill products.

The complaints should not be left unheeded by American west-coast lumbermen. It must not be lost sight of, however, that in comparison with the large volume of trade annually carried on with Chile, the instances of dispute have been relatively few and claims still fewer. The situation as a whole, considering the natural difficulties of standardization of export grades, has evidently been judiciously handled. The consensus of reports received was to a large extent not only satisfactory but appreciative, and good feeling for the manufacturers was generally manifested. This attitude is in marked contradistinction to the feeling of general dissatisfaction with American import lumber on the east coast of South America.

Another matter of special interest in connection with the Chilean purchases of Douglas-fir cargoes was the absence of any report from importers, dealers, or agents of any instance of lumber deteriorated in transit as the result of sap-stain discoloration or other fungous development. Lumber unloading, like that seen piled in storage, was as bright as could be expected; there were only occasional weather stains. The climate of northern Chile as far south as Valparaiso, owing to relatively little humidity, is particularly favorable for air-drying lumber and therefore unfavorable for fungous growth. In furnishing Chilean cargoes, shipping lumber properly conditioned to withstand the tropical passage will suffice, as the cargo, unless consigned to southern Chile, will meet no condition after arrival that is likely to promote deterioration from causes of this character.

The grade of sugar pine and white pine brought to Chile is mostly upper select, the grades used for foundry patterns and model stock. Southern yellow pine has been purchased in prime and merchantable grades of the Gulf coast export classification. The wood, having to reach Chile via New York by parcel freight, is handicapped, irrespective of qualities, by too high cost.

Hardwoods are bought according to American standard grades as to quality but not as to size. Firsts and seconds is the grade most demanded but considerable No. 1 common is also among consignments received. More dissatisfaction has been occasioned over the species and grading of hardwood imports than over any other wood shipped into Chile. The variable quality in different shipments of wood supposed to be of the same grade is the principal cause of complaint, which, if not promptly attended to by the hardwood dealers, will prove injurious to the already small trade in hardwoods that the United States enjoys in Chile. The solution doubtless would be to have every consignment bear with its papers the inspection certificate of one or the other of the two standard hardwood lumber associations of the United States.

Chapter IV.—ELEMENTS AFFECTING PRICES OF IMPORTED WOODS.

OCEAN FREIGHTS.

Schooner cargo rates from Puget Sound to Chilean ports normally range from 42 to 46 shillings (\$10.22 to \$11.19) per 1,000 feet. Six months ago, on account of the European war, barks and schooners were not to be had in sufficient numbers, and freights reached as high as \$15.40 per 1,000 feet. They have since dropped, and at present (September, 1915) are quoted at 54 shillings (\$13.14). The parcel rates on lumber from San Francisco and Portland are \$14 to \$17.50 per 1,000 feet, and from New York to Chilean ports steamers ask approximately \$24 per 1,000 feet and 20 per cent extra for pieces over 20 feet. From Southampton to Valparaiso the average normal rate of steamer parcels amounts to not quite \$20 per 1,000 feet. Schooners and barks carry native woods from southern Chile to the ports of the nitrate region at rates averaging \$9 to \$12 per 1,000 feet.

PORT AND DISCHARGING FACILITIES.

All harbors on the Chilean coast are ocean ports, but they have not docking facilities even for sailing vessels. Lumber is brought to Chile in both steamers and schooners; cargoes usually come in schooners, while parcels, often comprising large amounts, are carried in steamers. Unloading at destination is accomplished by means of lighters. In some ports the lighterage distance is over 1 kilometer (0.621 mile). Steamer charters specify unloading at an average rate of 100,000 feet per day, whereas the discharge of a sailer is stipulated at about 35,000 feet daily. Steamer unloading during certain seasons often requires as many as 15 to 25 lighters, and because of congestion due to inadequate wharfage space, crane and hoist facilities, etc., lumber can not be removed to the shore as rapidly as it is transferred from steamer to lighter. In the case of schooners the easier discharge allows about equal time at the vessel and the wharf, and without additional handling lumber may be placed directly in barracas or in permanent storage. The discharge of sailers, therefore, is more economical and for cargo shipments sailers are preferred in Chile and Bolivia. It takes schooners 70 to 85 days to make the trip from Puget Sound to Chile. They carry cargoes of 700,000 to 1,000,000 feet. Steamers require only 27 to 35 days. When infrequently used for cargoes, they carry not less than 2,000,000 feet, but steamers to Chile generally carry lumber on deck with mixed cargoes. The cost of lumber discharged in Chile, considering the difficulties involved, is reasonable compared with similar expenses in Brazil and Argentina, doubtless owing mainly to cheaper labor and to nominal port charges.

DUTIES IN CHILE AND BOLIVIA.¹

The customs classification of lumber in Chile is very simple. It does not take into account different sizes, such as logs, timber, strips,

¹ This section and all other statements of customs duty have been revised by the Division of Foreign Tariffs of the Bureau of Foreign and Domestic Commerce to accord with the provisions of the new Chilean tariff of May 10, 1916. The market prices given, however, are necessarily those prevailing under the former tariff. A general rise in the prices of imported lumber and lumber products may be expected to follow the general increase in the duties.

boards, deals, etc., which in other countries are listed separately. Moreover, all woods for construction purposes are grouped together and are dutiable at the same rate, irrespective of differences in value. The list of woods for construction purposes is to be determined by the Executive. All the fine woods (intended for making furniture) are likewise grouped together as cabinet woods and are subject to a uniform rate of duty equal to that on dressed building lumber. No distinction is made between those which have been planed or otherwise worked and those in the rough, the rate applicable to both being approximately \$33.92 per 1,000 feet. Under the old tariff fine woods in the rough were admitted at the very low rate of \$2.15 per 1,000 feet.

For soft building woods, not dressed, the present rate represents an increase of 66½ per cent over the old rate, and for the same woods, when dressed, the increase is 92 per cent. Hardwoods for construction, other than those classed as cabinet woods, are subject to a rate of duty reduced 25 per cent from the old rate, if not dressed, but if planed or worked, they are subject to a rate increased 28 per cent over the former duty.

The basis for levying duty is the Chilean gold peso, equivalent to 18d. (\$0.365), and the units of quantity are the kilo (2.2 pounds) and the square meter (10.76 square feet), 25 millimeters (0.9843 inch) thick. This thickness being practically 1 inch, conversions from square meters to board feet have been made on the basis of 100 square meters to 1,076 board feet.

The rates of duty on lumber and the principal lumber products are as follows:

Articles.	Peso.
LUMBER.	
Building woods, such as pine, carob, oak, and others to be designated by the Executive:	
Rough or merely sawed	per square meter, 25 millimeters thick
.....	..... do
Planed, grooved, or otherwise worked .....	..... do
Cabinet woods (jacaranda, rosewood, ebony, walnut, mahogany, cedar, ash, cherry, lignum-vitæ, elm, etc.)	per square meter, 25 millimeters thick
.....	..... do
LUMBER PRODUCTS.	
Blocks or splints for matches .....	..... per kilo gross
Thin boards for box shocks, shingles, etc. ....	..... do
Handles for tools, brooms, etc. ....	..... do
.....	..... do
Weighing not over 150 grams (about $\frac{1}{2}$ pound) each .....	..... do
.....	..... do
Weighing over 150 grams each .....	..... do
.....	..... do
Staves:	
.....	
Rough .....	..... do
Oak, dressed .....	..... do
Tubs, barrels, etc., assembled or knockdown, and dressed staves, not otherwise specified .....	..... do
Molding in the white .....	..... do
Bash, doors, parquet flooring, and other wood prepared for interior decoration .....	..... do
Pulp .....	..... per 100 kilos gross

Bolivia, because able to buy in carload quantities, procures a large portion of the Republic's lumber demand from Chilean markets. Oruro, the largest city, and other south Bolivian towns deal with Antofagasta; La Paz, the capital, and points in the northern part of the country deal largely with Arica. Lumber, rough and surfaced, is admitted to Bolivia duty free, and upon lumber going to Bolivia from stocks in Antofagasta and Arica the previously imposed customs tax

for Chile is refunded. To prevent complications and facilitate transactions the dealers in these two Chilean ports are given the privilege of deferring the payment of lumber duties six months by depositing with the Government a duly executed and approved bond. Within this period all lumber sent to Bolivia is indorsed as a credit on the dealer's bond and deducted for settlement at maturity.

DELIVERED COSTS.

The following table shows the c. i. f. cost, the duty, the cost of discharge, and the total delivered cost per 1,000 feet of various imported woods at different ports of Chile:

Kinds of wood.	Valparaiso.				Santiago.	
	C. i. f. price.	Duty.	Cost of discharge.	Total cost.	Railroad rate from Valparaiso.	Total cost.
Douglas fir: a						
Select.....	\$25.80	\$10.17	\$2.40	\$38.37	\$2.10	\$40.47
Other.....	21.20	10.17	2.40	33.77	2.10	35.87
Pine: a						
Sugar.....	97.80	10.17	2.40	110.37	1.80	112.17
White.....	111.00	10.17	2.40	123.57	1.80	125.37
Yellow.....	59.60	10.17	2.40	72.17		
Oak, red and white a	104.52	10.17	2.40	117.09	2.30	119.39
Poplar, yellow a	109.80	10.17	2.40	122.37	2.10	124.47
Ash, white and brown.....	105.00	33.92	2.40	141.32	2.25	143.57
Walnut:						
Black.....	168.00	33.92	2.40	194.32	2.20	196.52
French.....	173.00	33.92	2.40	209.32	2.20	211.52
Mahogany.....	189.40	33.92	2.40	225.72	2.30	228.02

Kinds of wood.	Concepcion, etc.				Antofagasta.			
	C. i. f. price.	Duty.	Cost of discharge.	Total cost.	C. i. f. price.	Duty.	Cost of discharge.	Total cost.
Douglas fir: a								
Select.....	\$24.20	\$10.17	\$1.80	\$36.17	\$25.60	\$10.17	\$2.70	\$38.47
Other.....					20.80	10.17	2.70	33.67
Pine: a								
Sugar.....	95.00	10.17	1.80	106.97	92.80	10.17	2.70	105.67
White.....	118.00	10.17	1.80	129.97	112.00	10.17	2.70	124.87
Northern.....	59.00	10.17	3.00	72.17				
Redwood a	79.00	10.17	1.80	90.97				
Cedar, southern white.....	170.00	33.92	1.80	205.72				
Oak, red and white a	108.00	10.17	2.00	120.17	110.60	10.17	2.70	123.47
Poplar, yellow a	109.00	10.17	2.00	121.17				
Walnut, black.....					173.43	33.92	2.70	210.06

* Undressed.

It may be interesting to compare the costs of foreign with the costs of domestic woods at the same markets; the rates per 1,000 board feet for domestic woods are shown in the following table:

Kinds of wood.	Valpa- raiso.	Santiago.	Concep- cion, etc.	Antofagasta.		
				C. i. f. price.	Cost of dis- charge.	Total cost.
Rauli.....	\$29.90	\$27.90	\$24.00	\$43.00	\$2.70	\$45.70
Lingue.....	30.10	27.60	18.57	21.50	2.70	24.20
Roble.....	21.15	20.24	20.20	20.20	2.70	31.60
Laurel.....	20.93	18.95	17.30	.....	.....	.....
Alamo.....	20.80	19.00	20.20	.....	.....	.....
Pine, Chilean.....	24.80	22.47	20.00	.....	.....	.....
Mafio.....	.....	21.60	32.80	.....	.....	.....
Alerce.....	.....	35.40	22.30	.....	.....	.....
Ulmo.....	22.50	24.70	20.70	32.60	2.70	35.30
Luma.....	24.80	26.60	.....	.....	.....	.....

Only the total cost, f. o. b. cars, is shown for domestic woods, because the various items entering into the delivered price of native lumber, such as cost of production, handling, loading, and rail transportation are variable at different points in the same region and are subject to frequent changes, as might be expected where the system of portable-mill production prevails.

LUMBER-TRADE METHODS.

Mills in the tidewater section of the northwestern United States, the Douglas-fir region, specialize in cutting export stock. Infrequently they sell direct to Chilean importers, independent of the medium of exporters. Most of the lumber purchases for this Republic are made through large concerns or corporations engaged in general export business covering not alone the west coast of South and Central America, but portions of several continents. They work for both import and export business in whatever country they are operating; in other words, they do not specialize in exports in one country and imports in another, unless conditions preclude chances for trade in one or the other direction. A home office is maintained in New York, London, or some other large city, through which all orders are executed, and branch offices are established in the principal port cities of the several countries in which operations are conducted. The functions of the branch offices, besides buying and selling, are attending to inspections, loading, discharge, installations, collections, and other details of international trade. In Chile, as in other South American countries, importers and import-export houses handle lumber in connection with general merchandise. A few maintain lumber departments similar to their machinery departments, because in handling and selecting forest products experience and technical judgment have been found essential. Men at the head of some of these departments have gained by experience and study a practical and, to no small extent, a technical knowledge of lumber woods.

One concern operates only in trading in lumber, domestic and imported, on Chilean markets. In foreign lumber it has developed a business of sufficient magnitude to justify it in having a purchasing

representative in the United States and in maintaining a fleet of schooners and barks to insure prompt and economical deliveries.

Several large general import-export concerns with offices throughout Chile and elsewhere in the principal markets of the West coast of South America conduct lines of freight steamers, which constitute important connections with the United States. These boats carry a large portion of the parcel-lumber and lumber-products consignments that come to Chile and Bolivia, of woods from the West coast and of white pine, yellow pine, and hardwoods from New York.

It is significant that all concerns in Chile, except one, that are interested in imports of foreign lumber are also concerned in the wholesale merchandizing of native lumber. A number maintain retail lumber deposits, stocking both imported and native woods, while several are interested directly in making national lumber and box shooks, and a few have plants for elaborating rough lumber, foreign and domestic, into milled products, such as flooring, ceiling, molding, and sash and door stock.

MARKETING SYSTEM.

Lumber in Chile is distributed through brokers, wholesale-retail, and retail establishments. The retail yards and deposits of varying size and importance are numerous throughout the Republic. Some have only an ordinary storeroom in the retail section of large cities and sell limited stocks in small quantities; others have modern, well-equipped establishments covering considerable ground, with stocks consisting of several million feet. Deliveries are solicited in both wholesale and retail amounts. The wholesaling of lumber is not a distinct business as is retail distribution. Firms importing foreign woods, almost without exception, exercise also the function of jobbers. Many of them maintain systems of branch deposits and lumber yards throughout Chile. They are not occupied solely with wholesale transactions; retailing is probably the more important part of their business. Being the medium by which all foreign lumber is brought to Chile, the importers might be expected to confine their attention to advertising and marketing foreign woods, but this is not the case, for, with a single exception, the principal lumber importers in Chile are equally interested in the domestic lumber trade. Besides carrying large stocks of domestic lumber in the markets, they have reserve stocks for a year or two in southern Chile, where it is in stack cross-piled for air-seasoning. The ability to carry on hand immense quantities in this manner gives this class of business the advantage of controlling the wholesale trade in domestic woods as well as in imported lumber. Because it brings much larger profits, the distribution of domestic lumber gets special attention. An illustration is a practice common in Santiago, where, in soliciting large contracts, dealers quote cut prices (often cost prices) on Douglas fir, with the proviso that they be also accorded the part of the business for which domestic woods are to be used wherever their sizes and character will answer.

MARKET PRICES.*

In the Chilean lumber trade, 100 square meters is taken as equal to 1,000 board feet, though the exact equivalent is 1,076 board feet. The cost of lumber to the consumer in the principal markets of Chile is shown in the following table. The prices given for domestic woods are for firsts and seconds. These statistics are based not on sale records of the present year, in which the disturbed conditions of the markets are reflected in too high prices of imported woods due to advanced steamer freight rates and too low prices of domestic woods due to large stocks and small demand, but on prices current late in 1913 and the early months of 1914. In this period the condition of the lumber markets were considered nearly normal and prices representative. Allowances for increase in foreign woods and decrease in domestic lumber of 25 per cent of the costs shown in the table will closely approximate the prices in the present market (September, 1915).

Kinds of wood. ^a	Santiago.	Valparaiso.	Concepcion. ^b	Antofagasta. ^c
Douglas fir.....	<i>Per 1,000 feet.</i> \$43.20-\$46.00	<i>Per 1,000 feet.</i> \$41.50-\$44.00	<i>Per 1,000 feet.</i> \$52.00-\$55.00	<i>Per 1,000 feet.</i> \$51.00-\$54.00
White pine.....	158.00-176.00	156.00-170.00	162.00	164.00-168.00
Sugar pine.....	135.00-150.00	132.00-150.00	80.00-84.00	145.00-152.00
Baltic pine. ^d	150.00-164.00	150.00-160.00	154.00	152.00-164.00
Elm.....	160.00-170.00	158.00	162.00-166.00	220.00
Red and white oak.....	200.00-230.00	184.00-195.00	180.00	180.00
Black walnut.....	156.00-165.00	150.00-160.00	164.00	164.00
Brown and white ash.....	164.00-175.00	158.00	160.00	160.00
Yellow poplar.....	47.00-54.00	50.00-54.00	34.00-36.00	59.00-65.00
Rauli.....	28.50-30.00	29.50-32.00	19.00-21.00	27.50-30.00
Roble.....	26.00-28.50	26.00-30.00	24.00-26.00	29.00-34.00
Laurel.....	24.00-26.00	27.00	26.00-30.00	26.00-30.00
Alamo.....	46.00-53.00	50.00-54.00	30.00-32.00	58.00-64.00
Lingue.....	30.00	30.00	28.00-31.00	35.00-38.00
Ulmo.....	54.00-58.00	54.00	46.00	52.00
Alerce.....	34.00-38.00	30.00-36.00	27.00-32.00	38.00-42.00
Mafio.....				
Cypress.....				

^a One inch thick and larger sizes, mostly 1 inch.

^b Includes other northern markets.

^c Includes other southern markets.

^d Only in Punta Arenas.

The foregoing table may properly be said to show retail prices, although lumber distribution in few-piece lots brings 10 per cent above these figures. Wholesale prices, or the cost of lumber to users in carload lots or quantities of 8,000 to 10,000 feet and more, are not fixed. They vary from 15 to 25 per cent below the prices in the table according to the terms and character of the purchase and various other considerations. Wholesale cost prices should not be confused with dealers' prices or the base costs of lumber, which were presented in a preceding table. A comparison of corresponding prices with the table just presented illustrates the margin required to cover overhead and handling costs, together with dealers' profits. The point of particular interest and of considerable importance to be noted in this connection is the apparently much higher rate of profit made on domestic woods than on imported lumber.

* A rise in prices may be expected to follow the recent increase in the duties on imported lumber. See p. 36.

Chapter V.—BUSINESS CONDITIONS AND TRADE METHODS AND PROSPECTS.**BUSINESS CONDITIONS.**

Doubtless no line of business in Chile has been more seriously affected by the financial and commercial depression resulting from the European war and national causes than that of marketing and manufacturing lumber. The latter industry has been practically paralyzed. Imports of Douglas fir fell in the first half of 1915 to one-sixth of normal receipts, and beginning in 1914 the general lumber demand, with no building nor public works and with greatly curtailed operations in the mines and factories, reached the low-water mark in the history of Chilean lumber markets. Nevertheless, there have been relatively few failures—a decided contrast to the experience of the industry under similar conditions in Argentina and Brazil. General business has begun to show signs of recovery throughout Chile. Starting in June with marked activity in the nitrate oficinas the improvement has spread and is reflected in increasing production of copper, iron, and coal. For the first time in the history of Chile potatoes have been exported. Meats, grain, and live stock have been affected by strong demands and unprecedented prices. Crop outlooks are reported excellent and the volume of imports begins to show improvement. That business is confident is shown in the rapid rise of the rate of exchange from 6 $\frac{3}{4}$ to 9 $\frac{1}{2}$ pence (\$0.139 to \$0.198) in a period of 60 days. In northern Chile the lumber business made considerable progress toward recovery, but in the central and southern sections the improvement of general business conditions so far has brought little benefit to the lumbermen and lumber dealers. Activity is anticipated, however, with the opening of the spring and summer seasons.

ENTERING CHILE'S LUMBER MARKET.

Chile offers little opportunity for selling lumber direct to the dealers, even to the few who have business and resources sufficient to justify stock purchases in cargo quantities. A majority of the large yards handling imported woods are owned or controlled by the big importers, who buy to advantage direct from the mills. Moreover, there are local trade agreements among the importers conducting the wholesale-retail lumber business in the markets of the several regions of Chile, which are designed to regulate prices and to prevent outsiders or importers not carrying local lumber stocks from selling to any dealer or wood users that purchase in amounts less than cargo lots. For example, an importer, not a dealer, sold a cargo to be divided among three small dealers. It was to be Douglas fir, and the quantity was to be not over 1,000,000 feet. Upon the arrival of the schooner, the "combine" yards, with large stocks on hand, lowered the price of Douglas fir to consumers 3 centavos per foot, board measure (\$5.18 per 1,000 feet), below the cost price of cargo shipments. This action compelled the three dealers to turn over the new consignment or else enter into agreement with the members of the "combine" concerning retail prices and future stock purchases.

In the nitrate region the prices of lumber are kept high by means of similar trade agreements, which, however, do not affect lumber purchases in cargo lots by oficinas and mines to be consumed in their own operations. Orders of this kind are sold throughout Chile by the importers on a commission basis.

Bolivia finds considerable disadvantage in the high prices maintained by the "combine," especially southern Bolivia, which depends on Antofagasta for its entire needs, buying from local stocks in carloads. The price of lumber in Oruro, for instance, reaches the high cost of \$85 per 1,000 feet, f. o. b. cars.

PROSPECTS AND SUGGESTIONS FOR TRADE EXPANSION.

With the prevailing sound trade conditions in Chile and the outlook for the substantial but gradual development of natural resources and industrial expansion, the prospects are encouraging for general increases in all lines of business in the Republic.

It has been shown that the national forest situation justifies the conclusion that native woods bid fair to decline slowly, rather than gain in commercial prestige. The scarcity of the most marketable kinds and the relatively small profits of the sawmills are becoming generally realized and having the effect of substantially raising prices. This situation will help to sell American lumber in Chile by reducing the present marginal cost differences in favor of native woods; that is, provided freight rates from North America recede to normal figures. That the domestic lumbermen recognize the situation as unfavorable is indicated by their recent efforts to influence Congress to raise import duties on lumber^a and to get officially approved the desired increase of rail tariffs on certain classes of articles, including lumber, from Chile's ports to inland cities.

NEED OF LUMBER-PROPAGANDA ORGANIZATION.

With general conditions favorable to the marketing and using of American woods in Chile, are there any measures that American lumbermen can adopt to increase the demand? Some such measures that appear important and practical to the writer are the following:

First, an advertising organization should be established in Chile. Most significant of all the lumber-industry conditions is that there is no business concern (except a few dealers in northern Chile) nor institution in Chile specially concerned in the distribution and in the future success of imported woods. American woods hold their market position and are making their way only by virtue of valuable properties as lumber. Very few dealers do not handle both American and Chilean products, and there is no dealer who would prefer selling imported woods. The public have no idea of comparative wood properties and nowhere in Chile can they learn. Think of a builder in the United States using American beech, unseasoned, for scantling, joists, girders, and rafters when he could get seasoned yellow pine, fir, spruce, or hemlock, which, even at slightly higher prices, would prove more economical and contribute to a better job. This is happening every day in Chile, whereas, if the truth were known,

^a The duties on lumber in Chile have been increased since this report was prepared. See p. 86.

the more practical lumber would be preferred. An organization is therefore needed to distribute information. Furthermore, such an organization is necessary to set forth the advantages of wood and enable it to meet successfully the competition of substitute materials.

It is believed that the wood users in Chile would respond to efforts to inform them how to use lumber and what woods to use. That wood is many times lighter than iron and, in equal weights, is stronger than iron or steel is not generally known; that lumber is tough and elastic and that no material is more easy to cut, fit, and put into place is rarely considered. Further, there is no one to maintain that proper seasoning will prevent shrinkage, twisting and checking, and, in many cases, decay; and that wood can be treated so as not to rot when exposed to dampness and so as to be fire-resistant. Then again it might be pointed out that wood does not contract nor expand with the temperature and that it does not hold heat and cold as steel does; and that painted lumber, in the open, will probably outlast galvanized iron.

The suggested organization could also develop new uses for lumber. There is an opening in Chile for a good grade of dwellings of cheaper construction than reinforced concrete and brick. Proper advertising could introduce and possibly make popular the American wood bungalow and cottage type of home. The rugged surface conditions of this country around Chilean cities are especially suitable for this type of architecture. It would probably not be difficult to introduce wood siding for general uses, especially if the siding was made in Chile from Douglas fir, western pine, redwood, etc. The wood silo also should be sold; this appliance for Chilean farmers is just beginning to be advertised. The cement man is on the ground contending for concrete construction. The wood silo, shipped from the United States, has not much advantage because of the high duty on worked lumber. An organization would look into the manufacture of one-piece silos from American lumber in Chile and thereby increase the demand. Wood tanks, if the merits of the proper woods for this use were properly presented, would similarly find a place in trade with the galvanized-iron and steel tanks now universally used in Chile. Another opportunity of service for the propagandist would be to increase the demand for American hardwood by inducing the Chilean furniture, fixture, and parquet-flooring makers to use woods as yet unknown but of varied and beautiful figure, like red gum, sycamore, and sugar maple, to employ more quarter-sawed material for the higher-priced products, and to see the advantage of adopting veneers and built-up panels.

The car builders could be shown the practical utility of Douglas fir and yellow pine if they were informed of the strength of these woods and other advantages of dry lumber over the green native woods now being used. In the nitrate, ore, and coal-mining regions a practical man acquainted with wood uses could make periodical visits and suggest uses of lumber in many places where at present more expensive substitutes are employed with little if any corresponding advantage.

Nothing works for decreasing trade more than goods of indifferent quality and high prices. The small demand that existed in Chile for veneer panels has been lost by the importation of poorly glued stock.

The market for hardwood lumber and for American white-oak tight staves is kept contracted by high prices.

The organization for propaganda work could cover the South American west coast and should be maintained not by one or two but by all the lumber associations interested in these markets, with the support of the veneer producers, the cooperage manufacturers, and the wood-pulp mills. Where manufactured flooring and sash and doors can be marketed, the American manufacturers in these lines should be requested to cooperate. By this means all the associations interested in lumber or lumber products would be kept informed as to market and trade conditions respecting their products, the progress resulting from the propaganda, and the principal competitors.

It is necessary to distribute in Chile intelligently planned and carefully prepared advertisements of American lumber. Even though this is not the general custom of the lumbermen in the United States, it is essential in South America, where lumber is more costly and where substitutes have gained a stronger footing.

NEED OF LUMBER DEPOSITS.

Secondly, two inexpensive lumber deposits, one in northern Chile and one in Santiago, should be established. This is essential for effective propaganda. There is room for other American softwoods without affecting the demand for Douglas fir. Redwood, white fir, sugar pine, western yellow pine, western red cedar, southern yellow pine, and cypress should be available and some of them common on Chilean markets. They will not be imported, however, until properly introduced by a demand originating with the wood consumers. The introduction of a wood is less difficult and more permanent when the lumber is on the ground for examination, experimentation, and trial orders. American hardwoods particularly would benefit by a deposit arrangement. There are certain special uses in Chile that hardwood would doubtless be called on to meet if it were at hand in proper grades and sizes.

It would not be the purpose of the lumber deposits or the propaganda organization to effect direct sales. They should not be inaugurated so as to upset present established market methods or trade relations. Any demand created by their work or deliveries solicited from the deposits would best be supplied through regular import channels. If conducted in this way, it is believed that the movement would meet with cooperation from the importers, dealers, factories, and consumers.

ACCURATE GRADING ESSENTIAL.

Thirdly, the strictest attention should be given to lumber grades. The mixing of domestic grades should receive the denunciation of every manufacturer and lumberman directly or indirectly interested in lumber exportation. In Chile this applies particularly to hardwood. It is essential that American lumbermen have staple and honest grades that will enable the Chilean to find the uniform standard of quality in lumber that they are confident, without test, they are receiving when they purchase American cement or steel. A per-

manent and a healthy export lumber business can be built only on standard qualities and full and honest measure. To effect this standardization is the first step toward increasing American lumber sales not only in Chile but in every country of South America.

STOCKS OF LUMBER IN CHILEAN MARKETS.

In connection with trade opportunities in foreign markets, the extent of stock on hand and its relation to normal stock is of considerable importance. The following table shows the stocks of lumber on hand and the normal stocks at various markets of Chile, according to estimates of local lumber dealers:

Markets.	On hand.	Normal stocks.	Markets.	On hand.	Normal stocks.
	<i>Feet.</i>	<i>Feet.</i>		<i>Feet.</i>	<i>Feet.</i>
Concepcion.....	150,000	250,000	Antofagasta.....	10,500,000	9,000,000
Valparaiso.....	4,000,000	7,000,000	Iquique.....	2,000,000	4,000,000
Santiago.....	2,750,000	4,000,000	Arica.....	250,000	500,000
Coquimbo.....	550,000	1,750,000			

Chapter VI.—PRINCIPAL USES OF DOMESTIC AND IMPORTED WOODS.

Wood utilization is distinct in the several regions of Chile. In the south native woods answer for practically all uses. Over the central region the cheaper native woods and the more applicable and better imported woods meet in active competition for market control. In late years the trade has been divided, slight advantage, if any, going to American lumber. Northern Chile purchases both native and foreign woods, but the relative consumption is doubtless more than 95 per cent in favor of the lumber shipped from the United States.

Foreign woods are brought to Chile in numerous sizes in the form of rough lumber. A considerable quantity, especially the large sizes, is employed in the rough for construction and similar purposes, but much the larger part is resawn and given over to further manufacture for various products in finished form.

For exterior building construction the Chileans seldom use wood. Cornices, parapets, abutments, porticoes, and porch work are almost entirely of concrete, steel, or brick stucco. The masonry and stucco work of the Chilean artisan is remarkable in its accuracy, permanence, and esthetic effect. Roofs are made of Spanish-shape terra-cotta tile and galvanized iron, the latter having almost universally supplanted the former. The nearest approach to wood roofing is split alerce wood shingles, made in far southern Chile, and split bamboo, imported from Ecuador. The merits claimed for the latter are that it is much cooler than metal or clay roofs, and is light in weight and cheap.

For interior construction, wood is perhaps more widely employed in Chile than in Argentina or Brazil. Panel wainscoting is more common, and wooden floors are often preferred to plain and fancy tile. Large double-door openings (8 by 12 feet) and similarly large window openings are common, wood ceilings are universal, and in rural and nitrate regions and cheaper houses in the cities wood partitions are not infrequent.

The following table shows the principal uses of different kinds of wood in Chile:

Rough construction:

Douglas fir.
Roble.
Cypress.
Coigüe.
Mafio.

Flooring:

Rauli.
Douglas fir.
Ulmo.
Laurel.
Lingue.

Ceiling, partition, etc.:

Douglas fir.
Rauli.
Laurel.
Alamo.

Molding and interior trim:

Douglas fir.
Rauli.
Laurel.
Lingue.
Araucaria.
Alerce.
Mafio.

Patterns and flasks:

Sugar pine.
White pine.
Redwood.
Alerce.
Chilean pine.
Mafio.

Piling and dock timbers:

Roble pellin.
Tenio.
Coigüe.
Cypress.
Muermo.
Quiaca.

Sash and doors:

Douglas fir.
Rauli.
Alerce.
Mafio.
Alamo.
Laurel.
Lingue.
White pine.
Sugar pine.
Scotch fir.

Plastering lath:

Alamo.
Douglas fir.
Cypress.

Cornice and exterior house work:

Douglas fir.
Alerce.
Rauli.
Mafio.
White pine.
Scotch fir.

Crossties:

Roble pellin.
Ulmo.
Douglas fir.
Coigüe.
Luma.

Wine tanks, vats, barrels:

White oak.
Rauli.

Trunks:

Douglas fir.
Laurel.
Rauli.
Chilean pine.
Mafio.

Wood pulp:

Alamo.
Chilean pine.

Furniture:

Lingue.
Rauli.
Cypress.
Tique.
Radal.
Lleuque.
French walnut.
Black walnut.
American oak.
Black ash.
Japanese oak.
Hungarian oak.
Mahogany.
Rosewood.
Sweet birch.
Yellow pine.
Douglas fir.

Vehicles:

Litre.
Luma.
Ciruelillo.
Meli.
Algarrobo.
American hickory.
White oak.
Chilean pine.
Mafio.

Coffins:

Lingue.
Douglas fir.
Rauli.
Laurel.
French walnut.
Black walnut.
Mahogany.
White oak.

Telegraph poles:

Douglas fir.
Roble pellin.
Mafio.
Cypress.

Match sticks:

Alamo.

IMPORTANT USERS OF LUMBER.

The oficinas (nitrate plants) and the mines, the wood-using industries, and the Government are the largest consumers of American lumber in Chile. Special lengths and convenient sizes, comparatively light weight, combined with superior strength and qualities adaptable for easy working and fitting, account for the wide use of Douglas fir by the nitrate oficinas and the ore and coal mines. In these industries this American wood answers for a variety of purposes. Though costly, it is employed occasionally even for lagging, sills, posts, caps, and segments of shaft lining of copper mines. In coal mines also it is seen serving in connection with mine-ventilation schemes for brattices, manways, chutes, screens, tipple parts, etc. Every oficina and mine has a wood department equipped with modern machinery devices for woodwork, building, and repairing, in connection with various constructions demanding lumber. Wood is used for administration houses, plant buildings, frames, sheds, shops, car repairs, maintenance of railroad and haulage systems, equipment and machinery parts, gates and fencing, and temporary structure.

The Chilean Government in its operation of State railways and the Departments of War and the Navy for construction and repair work annually demand considerable quantities of American soft and hard woods. Formerly the amount of imported woods used by the Chilean Government, because they were better conditioned and more adaptable than domestic woods, was equal to a large percentage of its total lumber consumption. Of late, through the influence of native lumber manufacturers, domestic woods have been substituted for imported woods in a number of important uses, thereby considerably curtailing the demand, especially for hardwoods.

WOOD-USING INDUSTRIES.

Factories using lumber or wood in the manufacture of wood products are not numerous nor extensive, but next to the industries of grinding wheat for flour and those interested in making wine, they are economically the most important factories in Chile. Labor is abundant and cheap and some of it is remarkably skilled. Wood-working machinery of important types is widely employed, the American-made machines being most used and well liked. Both imported and native woods are used as raw material. Among the wood-using industries are: Furniture, vehicle, railroad and street-car, and sash and door factories, ship and boat building and repairs, planing mills, match factories, box-shook mills, barrel factories, and parquet-flooring manufacture.

FURNITURE MANUFACTURE.

The furniture makers have only small establishments and few machinery devices, and employ a half-dozen or more workmen. They turn out some high-grade work, imitative of American, French, and Italian models. Considerable quantities, relatively, of native woods, especially lingue and rauli, are used in these operations both for interior or hidden work and for the exterior of cheap furniture.

For finish of the better types, French walnut, American oak, walnut, sweet birch, ash, and mahogany are imported. With this class of factories there appears an opportunity for marketing red gum, both plain and quartered. The color and figure of the heart wood of this tree are not dissimilar to French walnut, which is the most popular finish for expensive furniture made in Chile. Other hard-woods that are not too costly and are suitable for finish can be sold if properly introduced. Veneers and built-up panels have not yet been adopted because of trouble with the glue on veneered products sent to Chile from the United States; there is little interest in the subject among the furniture makers.

MATCH FACTORIES.

The match factories, of which there are two in Chile, do not import wood for match sticks. They use bolts of poplar (*Populus pyramidalis*) that are grown on the farms in the central region. Wood is brought to the mill in bolt form, but usually it is purchased in the standing tree, only the choice butt bolts of suitable grade for the requirements being selected. These operations are inextensive; the demand for raw material is not large.

CAR AND SHIP BUILDING PLANTS.

Because of the method of loading and unloading boats in all Chilean harbors by means of lighters, the building of these small boats, entirely of wood, is an industry of no mean importance in Chile. For parts of the framework, in which lengths up to 20 feet will answer, native woods are employed, but for keelsons and others of the longer and larger parts and for planking, Dougles fir usually meets the demand. The Navy Department of the Chilean Government has built a number of small launches and skiffs at the Navy Yard in Talcahuano. Worthy of mention among the American woods used is southern white cedar, purchased at high prices, for planking.

Car building is a relatively new industry in Chile and has not yet developed to large proportions. Freight cars, gondolas, box cars, cattle cars, etc., are the only types that are being constructed. The most important car-building operations are carried on in Valdivia and Valparaiso. Native woods are used almost entirely for this work, although considerable difficulty is encountered in obtaining seasoned rauli and laurel for box-car siding and roofing. The building of passenger coaches and trolley cars has not yet been attempted on a commercial scale; work on these cars is confined to repairs. Small quantities of lumber are required; American white ash, white oak, and yellow poplar make up a part of the supply.

VEHICLES.

Vehicles in Chile are most extensively used in the cities, and the type almost universally employed is the two-wheeled cart drawn by two and three small horses. These carts answer for the transportation of rough material (stone, dirt, etc.) and also for deliveries of

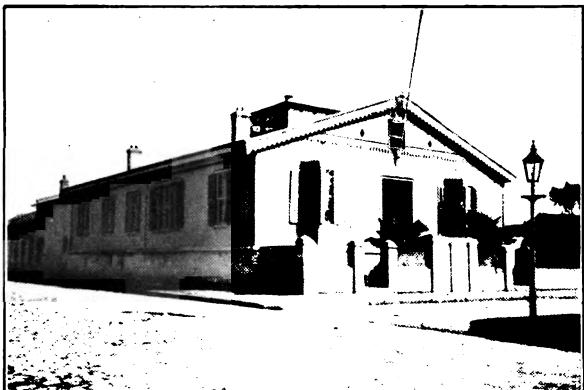
bread, ice, milk, wines, and groceries. In rural parts the common vehicle for farming and rough uses is the two-wheeled bullock cart. The four-wheeled wagon, common in the United States, is infrequently seen in Chilean cities and never in the country. All the cart vehicles used in Chile for heavy draft and delivery purposes are the product of home industries. They are built by hand in numerous small wheelwright's shops, which turn out only a few vehicles yearly. Domestic woods are employed almost entirely; for special purposes in this industry, several kinds have exceptional utility.

CROSSTIES.

Chile has approximately 4,000 miles of railroad. Over half is government-owned; the rest, built and operated by interests primarily for private facilities in connection with coal and ore mining and nitrate and borax operations. A large part of the Republic's tracks are the broad 5 foot 6 inch gauge. Belonging to the same system are branches and connections, which, like the private lines, are constructed of various gauges, 2 foot, 2 foot 6 inches, 1 meter (3 feet 3 inches), and 4 foot 8½ inches, the standard gauge. Sizes of crossties vary with the gauge, but 6 by 10 inches by 9 feet for the broad gauge and 5 by 8 inches by 6 feet for the meter gauge are the most common.

Douglas-fir and a few redwood ties from America and treated northern-pine ties from England have been brought to Chile and used in construction, principally in north Chile. These foreign woods are not standard tie woods in Chile. It is possible that more than 75 per cent of the total trackage in Chile and Bolivia is laid on sleepers of Chilean wood. Roble meets almost the entire demand at home; ties of this wood are accepted only if cut from the heart. The wood has an interlaced structure and in damp, immersed, and exposed situations shows remarkable durability. Instances are recited of roble ties remaining unreplaced in service after 16 years, but the average life is estimated at 9 to 12 years. For no other applications is roble pellin better adapted than for crossties; in this form it has occasionally been exported. A recent contract for 5,000,000 ties for Italy was countermanded before the work of extracting them from forests was begun, owing to the entrance of Italy into the European war. Occasionally a schooner cargo is taken to the River Plate region, principally Uruguay.

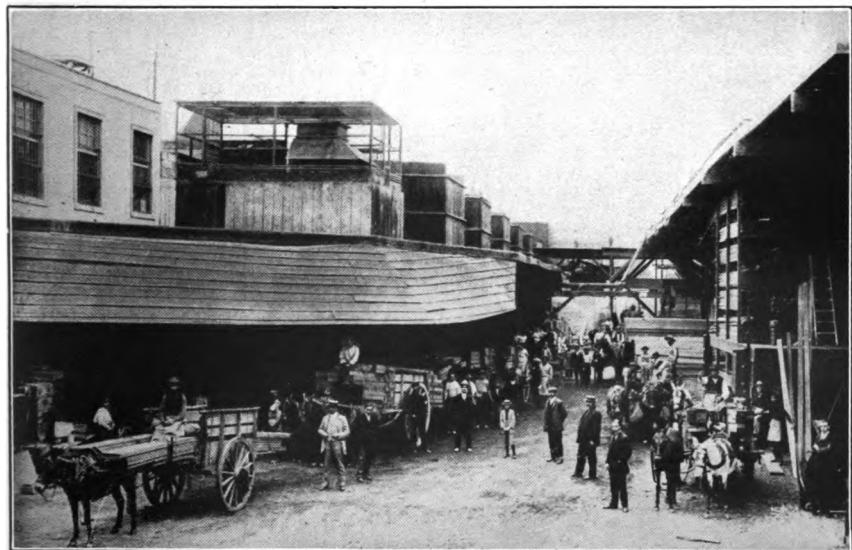
In northern Chile roble-pellin ties are not as highly favored. This wood in the rainless section is more refractory than elsewhere and is given to more serious checking. Ulmo ties are cheaper, give better service, and are in greater demand in this region and in Bolivia. The meter-gauge size crosstie of this wood costs about \$0.30 (American) delivered in Iquique and the broad gauge size \$0.44. For roble pellin the latter size, delivered, costs \$0.68 and the former size about \$0.45. All sleepers are transported by sailing vessels from the Puerto Montt section of southern Chile. In the central region roble, the only tie wood used, sells for an equivalent of about \$0.52 in a size 6 by 10 inches by 9 feet. On the wharf in southern Chile, in large quantities, the prevailing price of roble ties, of the dimensions mentioned, is about \$0.45 each. Special-size sleepers, standard in the United States, 7 by 9 inches by 8½ feet, recently cut on an order for



5. GALVANIZED IRON USED AS SIDING IN CONCEPCION.

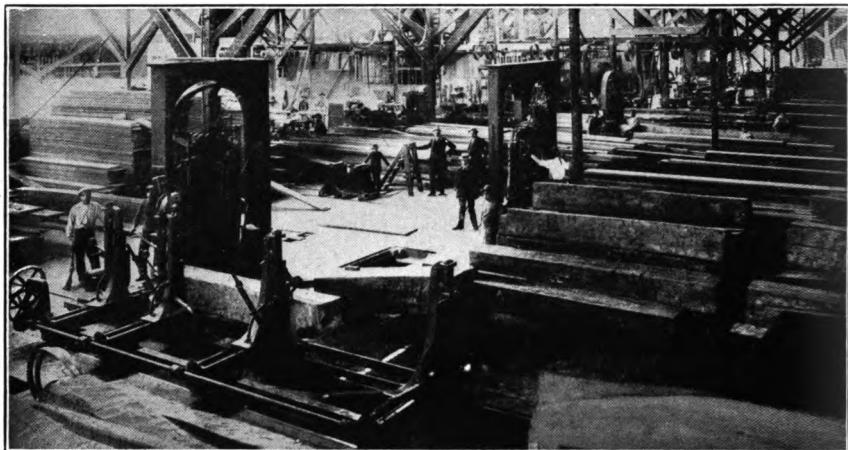


6. LUMBER DEALER'S ESTABLISHMENT IN LIMA, INCLUDING A PLANING MILL AND FURNITURE FACTORY.

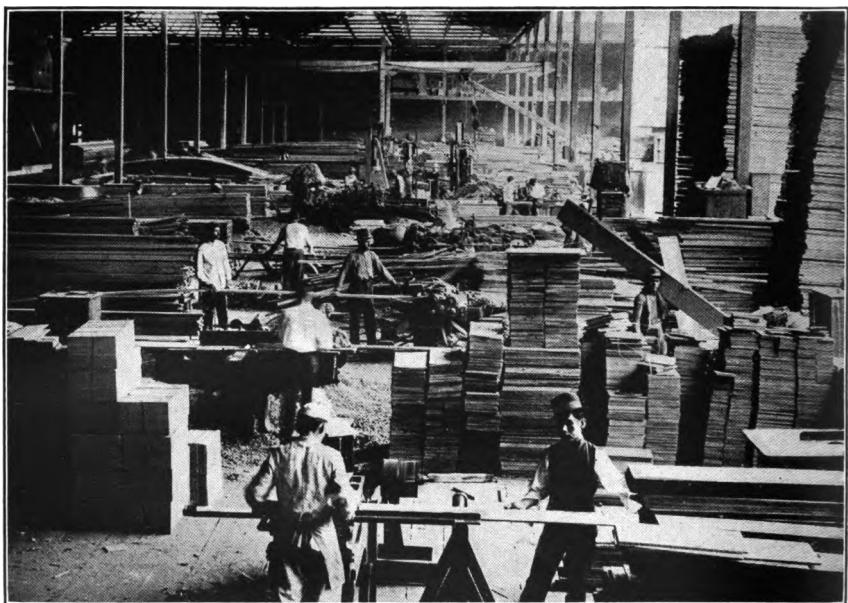


7. RETAILING LUMBER IN LIMA, PERU.





8. SQUARE SPANISH-CEDAR LOGS ARE CUT INTO LUMBER IN THE MILLING DEPARTMENTS OF THE MANUFACTURING CLASS OF LUMBER DEALERS IN PERU (SEE P. 77).



9. CUTTING BOX SHOOKS FROM SITKA-SPRUCE AND DOUGLAS-FIR LUMBER IN LIMA.

delivery to an American iron works in its Chilean operations near Coquimbo, were purchased in quantities at \$0.72 each.

POLES.

For wire lines and power-transmission purposes the wood pole, sawed square, is in universal use in Chile. Small, tubular iron poles, poles cut from discarded steel railways, and concrete poles are in service, but their use, as compared with wood, is limited. Especially in northern Chile and to some extent in the central section for cross-country wire lines, Douglas fir has occasionally met a part of the pole demand. The high price of the American wood, as compared with native poles, militates against its more extensive use. The heartwood of roble, the wood most employed for Chilean sleepers, is the chief material for wire-line supports. It is lasting in soil contact and when exposed to the elements, but its tendency to warp, twist, and check when in place makes instability its most serious drawback. This objection is more accentuated in the dry climate of northern Chile, where mañío from the regions about Puerto Montt is preferred and gives excellent service.

The standard size of wooden telegraph and telephone poles in Chile for cross-country lines is 6 by 6 inches by 22 to 26 feet. In large quantities the mañío delivered in the north is purchased for the equivalent of \$0.85 to \$0.90 per pole and the roble pellin for \$1.18 to \$1.35. In the southern section of Chile the roble poles, f. o. b. cars, delivered on the wharf, are handled at prices ranging from \$0.90 to \$1.10 each, according to length.

For wire lines in the larger cities of Chile, where poles 60 to 120 feet long are in use, Douglas fir has practically no competition. Like common shorter poles, they are all square cut but tapering. Butt dimensions vary according to height up to 20 by 20 inches. After brush treatment of the butts, preferably with tar, paint, or some anti-septic, the high poles are erected and planted in cement grouting. They are usually cut to order in the United States by special arrangements and, although expensive, have shown remarkable durability in service and are in high favor. A recent municipal regulation in Santiago requiring all overhead wire lines in the city to be removed by a certain time and put underground in conduits, considerably lessens Chile's demand for American wood for this purpose. Douglas fir is employed for crossarms because strong in proportion to its weight, but its use in Chile is small as compared with roble, ulmo, and lingue. Insulator pins and brackets from luma, and litre, coigue, or roble are most common. Yellow locust and osage orange pins, made in the United States, have been imported only on special orders.

BOXES AND SHOOKS.

The wooden-box industry, as to the quantity of lumber used, holds relatively the same importance in Chile in respect to lumber consumed as it does among the wood-using industries of the United States. It is second, the amount required being next to that needed for building material. The industry is divided into two sections, shook making and box making. Boxes are made in small shops distributed throughout the cities and towns of the Republic. They work principally to

assemble, buying their raw material in knockdown form. This group likewise includes the box department of factories for nails, soap, candles, pickles, sugar, etc., which make only shipping containers for their own requirements. The shook mills include several factories with modern machinery equipment and daily capacity of as much as 20,000 feet. Many sawmills also are producing shooks as a side line. Some cut rough shooks, others have a small planer with their cut-off and their ripsaw tables, and, by manufacturing box dimensions, are able to market low grades, otherwise left on the slab pile as waste. Timber in Chile, especially hardwoods, in certain sections is very faulty. The production of low-grade lumber, therefore, is large, and there is an abundance of raw material for boxes, which has led at times almost to overproduction and the selling of shooks below cost. Cheap labor is another important factor favorable to the box-dimension industry in Chile. The best paid workers obtain not over the equivalent of \$0.70 per 10-hour day.

Prices of shooks differ in the principal markets; a fair average would be 10 to 14 centavos per foot (about \$17.25 to \$24.15 per 1,000 feet). Recently, war-time prices have been and still remain 10 to 15 per cent below these figures.

Because of the low cost of shooks or new box material, second-hand shipping cases are practically a drug on the market. Remanufacture, the division of the box industry important in Brazil and Argentina, or shops producing make-overs, are no part of the trade in Chile.

The weight of Chilean woods has previously been given. Several common kinds are not heavy and, being fairly soft and easily workable, are suitable for shipping cases. Laurel, in texture not unlike yellow poplar, is the principal box wood in Chile. Its color, light olive green, seems not objectionable. The tendency of this wood to split when nailed and seriously to check in drying are unfavorable factors, but the handicap is not sufficient to prevent its employment as a successful box material. Other woods going into boxes are rauli and coigue (especially the sapwoods), and alamo, maño, Chilean pine, canello, sauce, and occasionally cypress.

Chile has recently started to export shooks, its first effort being to capture the trade from the United States in Bolivia. Following are shown the cost items of California white-pine shooks and shooks of Chilean laurel for candle boxes, sent to the same consignee in La Paz. The figures were copied from the importer's books:

American box shooks:

Original invoice for 8,000 boxes	do	408.00
Expense from San Francisco, Cal., to Mollendo, Peru	do	483.93
Total	do	891.93
\$891.93, at the rate of \$100=330 bolivianos	bolivianos	2,943.37
Customs duties in Mollendo, 324.05 soles (Peruvian), at the rate of 140 per cent	bolivianos	453.67
Freight from Mollendo to La Paz for 14.68 metric tons, at 34.40 bolivianos per ton	bolivianos	505.00
Drayage charges in La Paz to the factory	do	234.36
Total cost American boxes	do	4,136.40
Cost per box	do	0.52

Chilean box shooks:

Freight from Arica to La Paz and expense in the port for 15,550 boxes	bolivianos	1,801.75
Drayage charges	do	365.92
Customs duties and drayage in La Paz	do	1,035.95
Total cost Chilean boxes	do	3,203.62
Cost per box	do	0.206

WOOD PULP.

During the present European war, with traffic from Germany blocked and communication with Norway frequently and seriously interrupted, there is a market for American wood pulp in Chile. The principal objection made to pulp from the United States is the high price. There are three paper mills in Chile that heretofore have purchased their pulp supplies largely in Germany and a small amount direct from Norway. Since the war Norway has been furnishing the major portion.

One of the mills referred to manufactures a part of the pulp that it consumes, using the home-grown cottonwood or poplar, but because of the prevalence of knots in this wood, bolts of the proper grade are difficult to procure. More than any other factor this shortage curtails the production to less than half of the small plant's capacity.

Only cheap grades of paper and carton board are produced by the Chilean paper mills. Of the nation's consumption of paper, over 82 per cent is imported in finished form.

There is a movement on foot in Chile to erect a large wood-pulp and paper mill near the forests of araucaria in the Province of Cautin. This wood has proved exceptionally suitable for pulp, and Argentine capital plans to utilize it in a similar undertaking in that country.

The annual consumption of wood pulp in Chile amounts to about 3,840 metric tons of 2,204.6 pounds each, divided as follows: Sulphite pulp, unbleached, 2,640 tons, costing c. i. f. \$39 to \$42 per ton; soda pulp, unbleached, 300 tons, at about the same prices; mechanical wood pulp, brown, 300 tons, and white, 600 tons, each costing c. i. f. \$29 to \$32 per ton.

COOPERAGE.

Viniculture and wine making in the central region of Chile are industries of prime importance for which this Republic is widely renowned. The Chileans are extensive consumers of wine. They take considerable pride in the making of high-grade vintage, both white and red. Nearly 165,000 acres of vineyards are said to be under cultivation, a considerable portion of which is scientifically managed through the encouragement shown to viniculture by the Government. Chile exports wines to southern Argentina, where they undersell the home-produced wines because of high freight rates from Mendoza. Bolivia and Peru also receive vineyard products from Chile.

The marketing of wine in glass and to a much greater extent in barrels and casks creates a considerable demand for wood in this industry. Shipping cases are needed for the former, staves and

heading for the latter, and staves for vats and tanks. Wine boxes are supplied entirely by home-grown lumber. The tight-barrel supply is made of rauli, the softest and most workable of the native beeches, and of white-oak stock imported from the United States. The latter wood, when used for barrels, is reputed to improve the flavor of wine, and wines sold in white-oak barrels bring higher prices.

The following table shows the delivered wholesale prices per 100 in Santiago of rauli wine containers, in stave form, metal bound:

Types and capacities.	Stave thickness.	Price per 100.	Types and capacities.	Stave thickness.	Price per 100.
Casks:			Pipes:		
17-18 liters (4.49-4.76 gallons).....	<i>Inches.</i> 1	\$0.86	210-240 liters (55.48-63.40 gallons).....	<i>Inches.</i> 1	\$3.78
35-40 liters (9.25-10.57 gallons).....	<i>Inches.</i> 1	1.14	360 liters (95.10 gallons).....	<i>Inches.</i> 1	4.30
70-80 liters (18.49-21.13 gallons).....	<i>Inches.</i> 1	1.58	Do	<i>Inches.</i> 1½	5.52
Barrels:			Tanks:		
105-120 liters (27.74-31.70 gallons).....	<i>Inches.</i> 1	1.75	1,000 liters (264.18 gallons).....	<i>Inches.</i> 1½	17.25
140-160 liters (38.98-42.27 gallons).....	<i>Inches.</i> 1	2.42	2,400 liters (634.03 gallons).....	<i>Inches.</i> 1½	31.00
175-200 liters (46.23-52.84 gallons).....	<i>Inches.</i> 1	3.10	4,800 liters (1,268.05 gallons).....	<i>Inches.</i> 2	46.60

Tight barrels, pipes, and vat stock in Chile are made of rauli by sawing the staves and heading from plank procurable only in 10-inch widths. The highest grades are selected for this work, for which the barrel makers pay prices considerably higher than any other class of wood users. Containers made of rauli are more expensive than would be expected, considering that the wood is plentiful and the forests near by. The cost in large part is due to the wasteful method of manufacture. In its workable qualities and dense structure, rauli is suitable for tight containers. Its chief drawback is that it lacks the hardness essential for liquor barrels, owing to the rough treatment that they usually receive. The life of a rauli barrel is often less than half that of a white-oak container. Where the latter can be returned or rebought until worn, it proves in the long run the cheapest container.

Recoopering is an important branch of the tight-barrel industry in Chile, as in other South American countries. Special provision is attempted by the vineyards in negotiations for selling wines to insure the return of the barrels after the contents are used. A large number of secondhand oak barrels, knockdown, are shipped to the Republic from Europe. After being remade, they constitute serviceable containers at \$0.90 to \$1.20 per barrel less than new oak containers.

White-oak stock comes entirely from the United States in two sizes, 4 by 1½ inches, 1.40 and 1.10 meters (4.6 and 3.6 feet) long, usually in club form or rough staves. Only a small number of finished oak staves are received. Both forms come in parcel consignments shipped from New York. The average price of the rough product c. i. f. Valparaiso, in quantities of 5,000, is about 900 pesos gold, less 8 per cent for cash for the smaller size, and for the large size, 1,200 pesos for a like amount. This is equivalent to \$0.06 and

\$0.08, respectively, per stave. The price of the finished stave on the same conditions averages almost \$2.07 per knockdown barrel of 21 staves.

Rough staves are sold to the vineyards, which do their own coopering, at 0.85 to 1 peso (\$0.31 to \$0.37) per stave. The one complaint against American oak staves heard at every turn from those connected with the wine industry in Chile is their high price, which is said to be due to the large profits of the importers. The claim is that although the oak barrel is most used and much preferred, the cheap wines that constitute the major portion of the production of the Republic do not justify the use of so expensive a container.

Available statistics concerning barrel-stock imports are as follows:

Years.	Staves.				Empty barrels.
	Rough.		Finished.		
	Number.	Value.	Number.	Value.	Number.
1912.....	650,400	\$45,528	22,360	\$2,227	6,781
1913.....	400,300	28,021	20,630	1,984	3,852
1914.....	317,820	21,247	440	43	1,292

Slack-barrel stock is not a marketable commodity in Chile, there being practically no demand for containers of this character. Flour, cement, sodium nitrate, borax, etc., made in Chile, are distributed entirely in cotton and jute bags. Sugar refineries use boxes. For miscellaneous purposes a number of slack barrels are doubtless used in Chile, but the limited demand is more than met by the supply of secondhand barrels that find their way to the Republic as containers of various imported commodities.

FLOORING AND CEILING.

A portion of every cargo of Douglas fir arriving in ports of Chile consists of 4/4 strips 6 inches wide, which are used in making flooring, ceiling, partition, and molding. In addition, similar material is found in the upper grades of certain sizes of nearly every large consignment arriving, mixed with the merchantable grade. It is separated generally as it is discharged, is carefully piled for further seasoning, and later is given over to the working of these matched and surfaced products. Only two markets in Chile, except in rare instances, import finished flooring and ceiling from the Puget Sound district. At Antofagasta and Arica stocks of 300,000 to 600,000 feet are carried. None of this is consumed in Chile, because the duty, the handling and freight costs, and the initial price in the United States would put the price to the consumer at \$86 per 1,000 feet, allowing for the usual rate of profit in these markets. These milled products are kept on hand only to meet the Bolivian demand. Bolivia charges no duty on unsurfaced lumber, and, by arrangements made specially for these ports, the termini of the railroads leading to Bolivia, the dealers in Chile are enabled to keep lumber stocks on hand for six months without duty payments. At the end of this time all lumber not shipped to Bolivia is subject to the duties of Chile. Because of their changed form by further manufacture, rough

flooring strips brought to Chile to be worked are not included in these special arrangements, and therefore the finished products for Bolivia must of necessity be imported. No. 1 Douglas-fir flooring is the grade usually imported, although it is apparent that stocks on hand contain a portion of No. 2 grade. The Bolivians pay \$65.70 per 1,000 feet for No. 1 on board of cars in Chilean ports, the cost of which delivered in Chile is approximately \$42. In Oruro, Bolivia, this flooring and ceiling, f. o. b. cars, cost dealers close to \$116 per 1,000 feet.

Notwithstanding the fact that American parquetry has been subject to a duty considerably over \$100 per 1,000 superficial feet (changed to \$187.50 per metric ton by the tariff law of 1916), it has been held in high favor among those wealthy enough to afford it. The high duty has made possible the establishment of a native industry making parquet flooring imitating American patterns and using hardwoods shipped from the United States. The home product is desirable as to grade and workmanship, and, since woods employed for this use, as for furniture, have been admitted under a low duty classification, it has, in the past, sold for 50 per cent less than the imported parquetry. Much of the rough black walnut sent to Chile has been used in this manner.

The growing favor of hardwood floors that can be polished suggests a good opportunity for the development of a market for plain oak, beech, birch, maple, and other flooring that has so wide a demand in the United States. The finished flooring could be imported only to a small extent owing to the \$33.92 per 1,000 feet duty on elaborated hardwoods. The beeches, principally rauli, are the commonest flooring woods in Chile, but, being much softer than American beech and variable in color, they are not wholly adapted for making ornamental flooring. Ulmo, lingue, and laurel are other woods put to this use. The ulmo makes excellent flooring, although it is not ornamental and is exceedingly difficult to season. It is difficult to purchase any seasoned flooring of this kind.

Normal prices of flooring and ceiling in Chile are as follows:

Articles and kinds of wood.	Valparaiso and Santiago.	Antofagasta and northern Chile.	Articles and kinds of wood.	Valparaiso and Santiago.	Antofagasta and northern Chile.
FLOORING.					
Douglas fir.....	\$52.20-\$57.80	\$60.00-\$64.00	CEILING.		
Rauli.....	38.00-46.00	54.00-58.00	Douglas fir.....	\$52.00-\$54.00	\$60.00
Laurel.....	31.20-37.60	37.00-42.00	Rauli.....	40.00-42.00	54.00
Ulmo.....	36.00-40.40	.....	Laurel.....	26.00-33.00	36.00
			Alamo.....	22.50-26.00	28.50

The sizes of flooring and ceiling are as follows: Flooring— $\frac{1}{2}$ by $5\frac{1}{2}$, $\frac{1}{2}$ by $4\frac{1}{2}$, $\frac{1}{2}$ by $3\frac{1}{2}$, $\frac{1}{2}$ by $2\frac{1}{2}$, and $\frac{3}{4}$ by $4\frac{1}{2}$ inches; ceiling— $\frac{1}{2}$ by $4\frac{1}{2}$, $\frac{1}{2}$ by $3\frac{1}{2}$, $\frac{1}{2}$ by 5, and $\frac{1}{2}$ by 4 inches.

SASH, DOORS, AND BLINDS.

In Brazil, Uruguay, and Argentina the nation's supply of sash and doors is manufactured in small woodworking shops, but Chile, except in the northern part, produces the major portion of its sash and door products in factories that specialize in large quantities of

stock sizes. Special designs and sizes, of which there is a great variety for the front elevations of the better classes of houses and other buildings, are made to order in local planing mills, as in the larger cities, or as in Antofagasta and the north, in carpenter shops, where the work is done largely by hand.

The Chilean Government protects the Republic's sash and door industry by the imposition of a heavy customs tax on imported milled products. The rate is based on weight and is equivalent to about \$2.98 to \$3.40 per door, the variation in weight being due to dimensions, woods used, and patterns. On account of this, finished doors made in foreign countries are seldom seen on Chilean markets.

Sliding or weighted sash, common in North America, is not in demand in Chile, although it is seen here and there in the central and nitrate regions. As in other principal South American countries, the hinged sash is almost universally employed. Of interest to observers of wood uses visiting Chile is the building of houses with all openings, exterior and interior, except the main front and rear entrances, of one size and all fitted with sash doors in pairs. Sash, door, and shutter patterns and sizes considered standard in Chile are shown in the following table, together with average wholesale prices (1 meter=3.28 feet) :

Articles.	Sizes.		Cost per piece.	Cost per square meter of opening. ^a
	Length and width.	Thickness.		
Doors:				
Single—				
Battan.....	<i>Meters.</i>	<i>Inches.</i>		
2.50 by 0.85	2	\$2.10	\$1.35	
2.20 by .80	1 $\frac{1}{2}$	1.80	1.15	
2.50 by .85	2	4.20		
2.20 by .80	2	3.70	3.00	
2.20 by .80	1 $\frac{1}{2}$	3.00		
2.20 by .75	1 $\frac{1}{2}$	2.87	2.65	
2.50 by .85	2	4.75	3.25	
2.20 by .80	2	3.70	3.25	
2.20 by .80	1 $\frac{1}{2}$	3.36	2.90	
2.20 by .75	1 $\frac{1}{2}$	3.19	2.90	
Panel doors, 4, 5, and 6 panels.....				
Two panels, 4, 6, and 8 lights, unglazed.....	<i>Meters.</i>	<i>Inches.</i>		
2.75 by 1.20	2	6.46	3.30	
2.50 by 1.20	2	5.78	3.30	
2.75 by 1.20	2	7.45		
2.50 by 1.20	2	6.70	3.10	
2.50 by 1.20	1 $\frac{1}{2}$	5.90		
Double—				
Two panels, 4, 6, and 8 lights, unglazed.....	<i>Meters.</i>	<i>Inches.</i>		
2.75 by 1.20	2	6.46	3.30	
2.50 by 1.20	2	5.78	3.30	
4, 6, and 8 panels.....				
2.75 by 1.20	2	7.45		
2.50 by 1.20	2	6.70	3.10	
2.50 by 1.20	1 $\frac{1}{2}$	5.90		
Sash:				
Unglazed, 4, 6, and 8 lights, hinged.....	<i>Meters.</i>	<i>Inches.</i>		
2.00 by 1.20	2	2.25		
1.65 by 1.10	2	1.78	2.00	
1.60 by 1.00	1 $\frac{1}{2}$	1.50	1.80	
1.10 by .70	1 $\frac{1}{2}$	.95		
Blinds, interior:				
Single leaf, solid panel.....			1.70	
Single leaf, venetian.....			1.95	
Folding, solid panel.....			1.90	
Folding, 1 panel, 1 venetian.....			2.70	
Folding, 2 venetians.....			2.80	

^a Includes blinds, frame, lintel, etc.

Next to flooring, ceiling, molding, etc., the most exacting use of Douglas fir in Chile is doubtless for sash, doors, and blinds. It is difficult to say it is the most used wood going into these commodities because the native soft rauli, cheaper and fairly suitable, is widely employed, especially for doors and shutters. Continual annoyance has been experienced in the use of rauli by the sash and door makers.

The lumber can not be procured dry and the product of the few dry kilns operated, because of their primitive method and design, has been largely casehardened material. This situation has worked to the advantage of Douglas fir, so that even in the heart of the lumber region it is used for making sash and doors. For cheaper doors a combination of woods is used. For instance, jointed panels of alamo, combined with either rauli or Douglas-fir stiles, are very common, and also laurel or rauli panels with Douglas-fir and alerce stiles. Of the native-wood doors and windows, doubtless the best, but most expensive, is the product of Valdivia's factories made from alerce alone. In the nitrate region the Douglas-fir door is most common as the product of city carpenters. A few of the oficinas' woodworking shops use sugar pine.

SUBSTITUTES FOR WOOD.

In Chile, as elsewhere in South America, substitutes for wood have made remarkable progress. From a casual survey, one is apt to conclude that this movement is more pronounced in Chile than in countries on the east coast of South America. Here competition has made marked inroads on the demand for lumber, both imported and domestic, as is shown by the frequency with which other materials are used, even for purposes for which they are costly. In nearly every important commercial center in Chile there are organizations, directly representing manufacturers (principally American) of steel, iron, cement, asphalt, wall board, clay products, and composition roofing, the functions of which are propaganda and wider distribution of these products. That this work is being successfully prosecuted is shown by remarkably increasing sales and apparently wider utility for the wood substitutes. In no field is the wide demand for substitutes more noticeable than in house construction, where the use of corrugated iron is especially marked. Not only is it employed in the country for siding of farm houses and other buildings, and in the cities for sheds and shanty dwellings for the poorer classes, but it is commonly employed for the same purpose in the construction of better-grade houses, even in the principal urban resident sections. For roofing it has entirely superseded the former Spanish custom of using clay tiling. In the pampas of northern Chile buildings connected with the nitrate and mining properties are most often sided and roofed with corrugated iron. In the south, where lumber is cheapest and woods suitable for siding and shingles are easily obtainable, one is particularly struck with the large proportion of steel construction. An owner of an immense estate in extreme southern Chile, a principal operator among important stock-raising enterprises of those parts, after describing the extent of the forests on his lands of alerce and cypress, which possess the most valuable structural properties of all Chilean woods, and stating that labor is readily available for sawing, told of his recent completion of a commodious home on his farm, in building which he used for siding and covering, corrugated steel that had to be transported by pack horses 85 kilometers (53 miles) from the nearest boat landing. When asked why he selected this expensive material, he said it is generally considered best for conditions in this country.

Steel in place of wood for ceiling is not uncommon, and is gaining in popularity. Metal lath has in part supplanted wood, and wall board is beginning to be advertised. Steel sash and blinds are uncommon, but they are being pushed. Colored asbestos shingles are beginning to be favored, and composition roofing has become standard on the market. Concrete vine and fence posts, telegraph poles, piling, and silos are probably used enough to be beyond the experimental stage, while reinforced concrete for divers constructions, usually in building, is said within recent years to have made marked progress. For street paving asphalt is imported and almost universally used, even in the south, although paving blocks of roble pellin, the most available and plentiful of native woods, have proved especially suitable, without treatment, for this purpose.

PERU.

INTRODUCTION.

In no other Republic of South America are import and local conditions characterizing the lumber industry more satisfactory than in Peru. In addition to the fact that all but a small percentage of the lumber going into commerce in the country is the production of forests of the United States, the trade is characterized by equitable prices and profits, close regard for American standards of grading, care in storing and piling lumber, accuracy in resawing and further manufacture, precautions to reduce deterioration from fungi and insects, and general satisfaction with American export methods. Although the total lumber consumption and imports from United States to Peru are not as large as in certain other Republics, the situation illustrates to manufacturers and exporters the importance and advantage to themselves and to American commerce of delivering lumber cargoes that are standard as to quality, dimensions, measurement, and condition.

It is primarily the attention to details just described that has given American lumber a practical monopoly of Peruvian markets and has established for American lumbermen the reputation of square dealing, an asset much depended upon by Great Britain in South American trade. In the studious care with which shipments have been adapted to the demands of Peruvian markets, American export lumbermen have utilized an important leaf from Germany's foreign-trade handbook. These facts, together with a wide appreciation of the valuable properties of softwoods from the United States, have helped to induce a relatively wider employment of lumber in Peru than in Chile, Uruguay, and Argentina.

The situation is further significant in showing lumber importers and dealers of other countries of South America in which American trade is largely characterized by claims and controversies that some parts of the lumber industry of the United States know how to cut, select, measure, and condition lumber for export markets. The credit for the existing favorable conditions in Peru is due largely to manufacturers and exporters operating in the States on the Pacific coast, especially those interested in redwood, sugar pine, Douglas fir, and Sitka spruce.

In a market in which the domestic lumber industry is insignificant and in which so large and favorable a place is already occupied by American products, the extension of trade is concerned chiefly with (1) continuing and making even more general the practice of standard grading and accurate measurement, and (2) demonstrating the availability of wood for purposes for which other materials are at present utilized.

Chapter I.—THE COUNTRY AND ITS LUMBER RESOURCES.**GENERAL DESCRIPTION.**

The Republic of Peru covers an area of little more than 675,000 square miles. From the Pacific Ocean eastward the surface of the Republic extends for 700 miles over Andean ranges and plateaus, through valleys of the Amazon tributaries and across extensive plains to the Brazilian frontier. From the Ecuadorian line south to the Chilean and Bolivian boundaries the surface of Peru covers a distance of approximately 1,000 miles.

Before the opening of the Panama Canal Peru was in touch with the important commercial centers of the eastern United States and Canada, western Europe, and the West Indies only through the distant Straits of Magellan. Doubtless the country's inaccessibility accounts for its relatively limited development. With the facilities offered to South American west-coast countries by the Panama Canal, of which Peru will be one of the chief beneficiaries, the development of the country's rich resources presents a rare opportunity for American capital and exports, of which the lumber producers should not fail to take advantage.

The soil, mines, and forests are the chief sources of national wealth in Peru, and mining is generally regarded as most important and valuable, though at present the sale of crops and farm products, on an average of several years, shows that agriculture produces the largest returns.

INDUSTRIAL AND COMMERCIAL DIVISIONS.

The eastern, the Peruvian or central, and the western Cordilleras, three parallel mountain ranges traversing the country from north to south, divide Peru into three zones, as distinct climatically, topographically, and botanically as if they were far distant. The territory east of the mountains, together with the eastern slope, known as the *montaña*, is the largest but most sparsely populated region, which shows little commercial development. This region has an unmeasured expanse of tropical forests, which in soil and climatic conditions are similar to those of Brazil. The mountains, with their plateaus, constitute the second region, where mining activities are centered and where farming the rich soil of watered plateaus is profitable. One of the most important mining operations is being carried on at an altitude of more than 14,000 feet. Agriculture is the chief occupation in the arid coastal region, the narrow strip lying between the foot of the Andes and the Pacific Ocean, which is practically a continuation of the rainless section of Chile. Plant and tree growth are possible only as the result of irrigation. In spite of the wonderful fertility of the soil, not half of this region is under cultivation, owing to the lack of further irrigation. A number of irrigation developments are said to have been projected and authorized that have not yet been undertaken. When these are completed the present cultivable area of this coastal region, about 75,000 acres, will be considerably extended.

POPULATION.

The number of people living in Peru is roughly estimated at 3,500,000 to 4,000,000, which appears to give this Republic a standing ahead of any other west-coast country. The advantage, if it exists, is offset, however, by the fact that the consuming population is only a small percentage of the total number of inhabitants. About one-sixth of the population is white, 3 per cent Chinese, a fair number an admixture of Spanish and Indian blood, and the rest Indians and a few immigrant negroes.

The Indians separate into tribes distinguished by different dialects, pursuits, manners, and customs. These tribes live at peace in communities close to one another, and alongside and often a part of progressive white settlements without appropriating the traits, customs, and ideals of the more enlightened. The tribal Indians show varying degrees of enterprise, capability, and capacity for work. Some take successfully to agriculture and horticulture as independent farmers and many more to stock raising and herding. Numbers are occupied with merchandizing on a small scale. Some are tradesmen, butchers, tailors, and shoemakers, while others have developed into skilled mechanics. The majority that are regularly employed are found in the mines, or on farms and public works, as burden bearers in transporting merchandise, and in other lines of manual labor. In the montaña and eastern Peru there still exist tribes of Indians in primitive state.

The lack of education and the poverty of the lower laboring classes, a large part of the population, constitute Peru's greatest national problem. Efforts are being made to improve the condition of these people, whose great need is education, particularly along manual-training and industrial lines.

MARKETS.

Civic development in Peru is not considerable, because the greatest portion of the population, the Indians, live in villages and small communities. Of the cities, Callao and Lima, the former the principal seaport and the latter the capital and metropolis, are almost grown into one city and are the center of the greatest commercial activity of the Republic. The population of the twin cities is said to be approximately 200,000. The next important centers, Arequipa, Cuzco, Piura, and Huancayo, have populations of less than 40,000. The Republic has over 80 towns, ranging in size from 2,000 to 15,000, worthy of commercial classification. They are scattered over sections of the sierras and coastal plains.

The most practical commercial division of Peru is into regions indicated by the seaports. For instance, Mollendo, of little consequence outside of harbor activities, is the gateway, via the Southern Railway of Peru, to the section that includes the busy city of Arequipa with its outlying territory engaging in important agricultural, stock-raising, and mining pursuits. Farther inland lies the country close to Puno, which is the transfer point for shipping across Titicaca Lake into Bolivia and is noted for its output of petroleum, vanadium, borax, gold, and silver, and busy with the herding of sheep, alpaca, and llama. Still farther inland is Cuzco, an important city of 35,000

inhabitants, to which commodities out of the montaña are brought for dispatch to market. Here the manufacture of cocaine is a thriving industry, and in the vicinity the growing of coca, coffee, and tobacco, and various mining activities are the chief occupations. Similarly Callao is the supply center for Lima and its rich irrigated country and for innumerable towns, communities, and mining sites of the interior included in the region served by the Central Railways. Through this port the largest shipments of minerals and many other valuable commodities are brought for export. Salaverry in the same way is the port of entry for the country's famous sugar-raising district. Through Paita the railway leads to Piura, the center of the region of important cotton plantations, and to Catacaos, where the Panama-hat industry flourishes and where large shipments of goat and kid hides come from surrounding mountain sections. The largest petroleum operations are within this region.

The several commercial regions of Peru, the railroad connections, important cities and their population, and the chief occupations are shown in the following table:

Regions.	Railroads.		Important cities.		Industries.		
	Names.	Miles.	Names.	Population.	Agriculture.	Mining.	Manufactures.
Callao.....	Central Rys.....	250	Lima.....	Callao.....	Sugar, cotton, fruit, vegetables, grain, alfalfa, grapes, stock raising.	Copper, silver, quicksilver, coal, tungsten.	Candles, soap, cotton goods, woolen goods, flour mills, cottonseed oil, furniture, vehicles, planing mills.
	Cerro de Pasco.....	742	Junin.....	Lima.....	40,000		
			Huancavelica.....	Oroya.....	160,000		
				Cerro de Pasco.....	500		
				Ayacucho.....	6,000		
				Huancayo.....	22,000		
Mollendo.....				Huancavelica.....	6,000		
					8,000		
				Arequipa.....	42,000		
				Puno.....	7,000		
				Cuzco.....	35,000		
Southern Rys.....	Arequipa.....	536		Bolivian cities.....			
	Monjequira.....						
	Puno.....						
Salavery.....	Puno.....						
	Cuzco.....						
	Northern Bolivia.....						
Trujillo Ry.....	Liberiad.....	72		Trujillo.....	12,000		
				Pajian.....	4,000		
				Ascope.....	4,000		
Eten and Pacasmayo.	Pacasmayo & Guadalupe Ry.	104	Lambayeque.....	Pacasmayo.....	4,000		
	Eten Ry.....		Liberiad.	Guadalupe.....	3,000		
			Caxamarca.....	Caxamarca.....	14,000		
Palta.....	Ptura-Paita Line.	30					
			Plura.....	Paits.....	9,000		
				Plura.....	11,000		
Chimbote, Pisco, and Ilo.	Chimbote-Resary Ry.	74		Catacos.....	37,000		
	Ilo-Pisco Ry.			Sechuan.....	7,000		
	Moqueguia Ry.						
Iquitos.....	Liberiad.....	65		Chimbote.....	1,000		
	Amacachas.			Huaraz.....	18,000		
	Ica.			Ics.....	9,000		
Boat lines via Atlantic and Amazon River.	Moqueguia Ry.	46		Moqueguia.....	8,000		
		162					
				Iquitos.....	20,000		
				Loretto.....			

AGRICULTURE.

Sugar, cotton, and rice are the principal crops, chiefly in the western, or coastal, zone. Their aggregate annual production is valued at more than \$20,000,000. Sugar is equal to the combined values of the other crops and is exported chiefly to Chile and Great Britain. The industry of farming these staples is in control of foreign companies, with big capital, which carry on extensive operations. The size of plantations (commonly called haciendas) under single management is stated to reach as much as 45,000 acres. The English, largely interested in these undertakings, have made notable successes financially and have helped Peru to improve the efficiency and conditions of the laboring classes. Many of these estates operate sugar mills, rice mills, and cotton gins, and utilize by-products and unsalable grades of products in the production of distillates, alcohol, and rum, and lighter beverages popular with the natives, such as chicha, aguardiente, etc. These collateral activities, with the main farming operations, require large resident labor forces that make the various plantations take on the aspect of well-populated communities and industrial centers.

Other crops cultivated and receiving increased attention are coca, the plant from which cocaine is made, and tobacco, coffee, tropical fruits, cacao, alfalfa, cereals, and grapes. Viticulture is an increasingly important occupation near the coast below Lima, while the raising of the other commodities mentioned belongs to the plateaus and the montaña. The herding and raising for wool and hides of sheep, goats, llamas, vicunas, and alpacas is an occupation of the Andean region that is attaining more and more commercial importance.

MINING.

Thirty minerals, nearly all of marketable value, have been found in quantities in Peru. Mining operations on a commercial scale are as yet conducted for only a few of the metals, but with the building and extension of railroad lines under consideration, concerns organized and awaiting only means of transportation will soon, it is claimed, begin operations. Gold and silver for centuries have been the main production of Peru's mines. They are still important sources of national wealth, and their mining is said to be among most promising of Peru's mineral opportunities. In late years the development of copper deposits in the hands of wealthy syndicates, under expert management and with elaborate, complete, and modern plant equipment, is proving a success and a decided impetus to the Republic's commerce. The annual production of copper, Peru's leading mineral, in the several forms in which the metal is marketed, is estimated to reach a total valuation of \$10,000,000. Among the copper mines is the most extensive development of its kind in the world, of which the steadily increasing production now reaches over 50,000,000 pounds a year.

Next to copper, none of Peru's underground resources has increased the Republic's industrial prestige more than the production of petroleum. Recent developments extensively enlarging the business have put it upon a modern and substantial basis. The west-

coast countries, including Bolivia, are depending more and more for fuel upon the Peruvian output. Chile's nitrate of cinchona are the largest consumers, and various mining operations in that country and in Bolivia and Peru are large purchasers, as are transportation companies operating oil-burning locomotives and steamships. Not nearly all the production of crude oil is sold for fuel. Refineries are active in distilling kerosene, gasoline, and other oils from petroleum, and large quantities of the crude product are taken to the United States to furnish raw material for the California refineries. In spite of the immense output of petroleum and copper in Peru, the development of both these industries, judging from reports of various deposits located but yet untouched, is barely begun. To American interests is due the development of these industries to first rank among the country's enterprises. It is said that vast deposits of rich lead and zinc ores—minerals of which the output in Peru has been negligible—have been taken over by American interests for mining on a large scale. Located beds of calcium, vanadium, quicksilver, bismuth, nickel, iron, tungsten, antimony, sulphur, etc., indicate the possible future for mining in Peru.

COMPARATIVE VALUE OF FOREST PRODUCTS.

Until recently an annual production valued at about \$6,000,000 put rubber next to sugar and copper, the Republic's most valuable products. Other forest products of nominal and largely local importance are ivory nuts, cinchona bark, and lumber. The first named, in trade called carosso nuts, are taken from a palm, termed scientifically, *Phytelaphas macrocarpa*. The substance of the nut, soft and albuminous when young, hardens by the time of maturity and resembles in texture and color the finest ivory. It is the principal button material the world over. The fact that the industry is less important (annual production not over \$40,000) than in Ecuador and Colombia is due not to the scarcity of the palm in Peru but to its inaccessibility.

Cinchona bark, or Peruvian bark, is stripped from trees growing on the lower eastern slopes of the Andes. The importance of the industry in commerce is hardly worthy of mention, except that in its production Peru probably leads the world.

FORESTS AND LUMBER INDUSTRY.

The eastern, or montaña, region of Peru, over half of the Republic's area, is practically covered, like the adjacent territory in Brazil, Bolivia, and Ecuador, with dense forests of large trees indigenous to the Tropics of the southern continent. Several small sawmills in the neighborhood of Iquitos, the commercial center of eastern Peru, and the hand-sawing by natives in the jungle of boards seldom longer than six feet constitute Peru's lumbering activities. The mill products are used locally, while the hand-sawn boards are carried by the Indians up the mountains to markets. Trips take as much as 30 days one way on account of the long distances and arduous climbs. The pack parties are large, but the limited number of short boards carried by each burden bearer makes the total pro-

duction from this source exceedingly small. Cuzco receives most of this native lumber and Piura the rest.

Spanish cedar grows in frequent stands over wide areas of eastern Peru and is cut into lumber more commonly than any other native wood. Nogal, which in color and structure closely resembles the butternut of the United States; palo rosa, not unlike Brazilian peroba; jacaranda, or rosewood, and a lumber commonly called espintana are other native woods occasionally seen on the markets.

The woods mentioned are a very few of the available kinds growing in Peru and nearby Bolivia. Collections of samples to be seen in the capitals of these Republics taken from their tropical forests are beautiful in color and attractively mottled, and indicate the many varieties and qualities that these unmeasured woodlands contain. Doubtless many of these species, seen in lumber form and worked into furniture and other uses requiring decorative finish, would find ready demand in the world's markets. They could be had in extensive widths, for trees of large diameter are said to be abundant, but innumerable difficulties, more arduous than usually attend the extraction of tropical timbers, and the lack of transportation facilities make lumbering in these parts on a commercial scale impossible.

Civil engineers have studied various locations in the Republic with a view to building railroads to these forests. The concensus of reports is that the tremendous cost of building over the Andes would make necessary too high freights on lumber and logs for them to be profitably marketed via the Pacific coast. This information, although contrary to general impressions in Peru, is especially interesting to lumbermen in the United States. It means that American mills, particularly those operating on the Pacific coast, can safely rely on Peru for an annual average demand at least equal to present imports. If, however, certain necessary measures are undertaken, the markets bid fair to improve with the Republic's assured, if gradual, commercial expansion.

Chapter II.—IMPORTS AND DISTRIBUTION.

IMPORTS AND PRODUCTION, BY COUNTRIES.

In the quantity of lumber consumed, not including crossties, mine props, firewood, and other similar products taken rough from forests, nor finished commodities other than a nominal amount of surfaced lumber imported, Peru stands fifth among South American countries. To the United States the wood-utilization situation here is interesting, first, because a larger percentage of American lumber is consumed than in any other South American Republic; secondly, because of the lumber going in commerce, the ratio of domestic woods used is less in Peru than in any other of the nations possessing extensive forest areas; and thirdly, because of all the commodities exported by the United States to Peru lumber has the largest total value.

Peru's aggregate imports amount to about \$25,000,000, of which England supplies much the major portion and the United States stands second with about one-fourth or one-fifth. Of the various classes of imports shown by the Republic's official statistics, taking an average of five years, in none does the United States stand first, ahead of European countries, except in lumber and lumber products.

The following table shows an average for 1912, 1913, and 1914 of the quantity, price per 1,000 feet, and value of the lumber consumed in Peru, with the principal countries of origin. Official valuations of lumber and lumber products imported into Peru are arbitrary values by classes fixed by law. Because the costs of lumber vary according to kinds, sizes, and grades, c. i. f. prices collected from reports of importers were substituted for official figures.

Countries.	Quantity.	Price per 1,000 feet.	Value.
<i>Feet.</i>			
United States.....	43,140,800	\$29.06	\$1,253,672
Central America.....	540,400	46.00	24,858
South America.....	476,300	73.84	35,170
Europe.....	80,000	42.00	3,360
Australia, Japan, etc.....	12,300	90.50	4,733
Peru.....	160,000	42.00	6,720
Total.....	44,449,800	430.00	1,328,512

• Average.

Costa Rica is the country where most imports from Central America originate. Ecuador and Chile contribute the portion from South American Republics, the forests of Scandinavia produce almost all the European supply, and from the Orient the contribution is chiefly from Australia and Japan.

IMPORTS AND PRODUCTION, BY KINDS OF WOOD.

The following table shows the consumption of various kinds of domestic and imported lumber in Peru during 1912, 1913, and 1914, and the average for the three years:

Kinds of wood.	1912	1913	1914	Average.
<i>Feet.</i>				
Fir, Doug'as.....	25,974,550	40,992,700	42,051,630	36,339,600
Redwood.....	2,000,000	3,900,000	3,532,000	3,144,000
Spruce, Sitka.....	638,000	800,000	1,060,000	832,700
Pine:				
Sugar and white.....	368,000	710,000	574,000	550,700
Fon't ern ve'ow.....	180,000	504,000	439,000	373,600
Northern (Baltic).....	238,000			80,000
Cedar, i' spanish.....	147,000	807,200	687,000	540,400
Hardwoods:				
United States.....	1,658,000	1,066,900	2,975,700	1,900,200
Peruvian.....	230,000	150,000	101,000	160,000
Other.....			21,000	
Rob'e, i cuadrian.....	171,100	146,000	233,000	183,300
Rauli, Chilean.....	208,100	100,000	571,000	293,000
Oak, Japanese.....			33,000	
Jarrah, Australian.....		60,000	43,000	52,300
Total.....	31,792,750	49,236,800	52,321,330	44,449,800

The most important United States hardwoods are oak, ash, yellow poplar, and walnut. Separate statistics could not be ascertained, but the order in which they are named doubtless indicates the relative importance of these woods. The Peruvian hardwoods include the native woods cut and used east of the Andes and the small parcels carried to market out of the montaña over the Andes. The

figures representing consumption in the Amazon territory are based on the estimate for the city of Iquitos by a resident thoroughly acquainted with conditions, but not a lumberman. The miscellaneous hardwoods are small amounts of various kinds occasionally brought in from Central America, Colombia, etc.

IMPORTS AND PRODUCTION, BY PORTS.

The comparative commercial importance of the several regions of Peru previously described is further indicated by the quantity of lumber consumed in each, as shown in the following table for three consecutive years. Except for small quantities of lumber cut and used in eastern Peru, the figures presented are taken from official import records. Not all the lumber credited to Callao is used in that region. Boats ply up and down the coast and carry small consignments from stock to ports of other regions, yet these transactions, being national, are not taken into account in the Government's statistics.

Through the port of Mollendo, shipments of lumber destined for Bolivia are taken into that country via the Southern Railway of Peru and steamers across Lake Titicaca, but the entire northern Bolivian demand is not routed in this way, as was formerly the case. The recent completion of the Arica-La Paz Railroad from the port of Arica, Chile, affords another and a shorter entrance to Bolivia, and the competition has already favored the importation of American lumber by effecting a considerable reduction in railroad freights. Imported lumber taken into Bolivia through Peru is usually stored in barracas in Mollendo and shipped by rail as the demand warrants. At Arica it is taken from lighters directly aboard freight cars and shipped at once. Some of the more important La Paz dealers have their deposits in Mollendo, while others buy from stocks of the Peruvian lumber dealers at that point or infrequently at Arequipa. Lumber imported into Peru intended for Bolivia, and lumber sent to that country from Peruvian stocks are not included in the figures of the following table covering the Republic's consumption.

Regions.	1912		1913		1914	
	Quantity.	Value.	Quantity.	Value.	Quantity.	Value.
Callao.....						
Feet.			Feet.		Feet.	
22,818,000	\$740,811	31,315,000	\$938,095	38,936,000	\$1,286,837	
Mollendo.....	736,000	23,129	4,796,000	141,576	4,608,000	121,443
Salaverry.....	2,591,000	68,194	5,552,000	129,368	2,059,000	55,360
Paita.....	3,26' 000	78,255	4,111,000	101,740	3,125,000	77,923
Etan and Pacasmayo.....	1,440,000	40,425	2,235,000	53,651	2,611,000	72,812
All other.....	922,000	29,416	1,198,000	27,170	982,000	22,044
Total.....	31,793,000	980,230	49,237,000	1,391,598	52,321,000	1,636,419

"All other" includes the regions of the Republic reached through the ports of Ilo, Pisco, and Chimbote. Callao, Paita, and Chimbote afford the best harbors on the Peruvian coast. The last-named is the safest, a natural harbor well protected, with sufficient depth close to shore. Callao is the only port of the country provided with wharves at which ocean steamers and vessels can dock. In a few

of the ports vessels are compelled to anchor as much as a mile out. Unloading is frequently interrupted by rough seas, and in case of severe storms vessels are compelled to put to sea in order to prevent being beached.

IMPORTS AND PRODUCTION, BY KINDS OF WOOD AND PORTS.

Exclusive of Spanish cedar, the American woods hold the major portion of the hardwood trade and would have reached a still higher position in Peruvian markets but for the prevailing prejudice, due, it is claimed, to the lack of uniformity in American grading of hardwoods for export. There are 16 hardwoods and 6 softwoods going into commerce in Peru. The distribution of these 22 woods among the several market regions of the Republic is shown in the following table:

Kinds of wood.	Callao.	Mollendo.	Salaverry.	Paita.	Eten-Pacasmayo.	All other.	Total.
	<i>Feet.</i>	<i>Feet.</i>	<i>Feet.</i>	<i>Feet.</i>	<i>Feet.</i>	<i>Feet.</i>	<i>Feet.</i>
Fir, Douglas.....	21,013,000	3,011,000	3,123,000	3,280,000	1,955,000	1,009,000	36,391,000
Redwood.....	2,817,000	100,000	147,000	80,000	.....	.....	3,144,000
Spruce, Sitka.....	833,000	.....	.....	.....	.....	.....	833,000
Pine:							
Sugar and white.....	448,000	57,000	50,000	33,000	56,000	7,000	651,000
Southern yellow.....	292,000	48,000	21,000	20,000	20,000	.....	401,000
Northern (Baltic).....	.....	.....	80,000	.....	.....	.....	80,000
Cedar, Spanish.....	470,000	41,000	.....	29,000	.....	.....	540,000
Roble, Ecuadorian.....	108,000	.....	.....	55,000	20,000	40,000	223,000
Rauli, Chilean.....	262,000	31,000	.....	.....	.....	.....	293,000
Jarrah, Australian.....	32,000	11,000	.....	.....	.....	.....	43,000
Oak, Japanese.....	10,000	.....	.....	.....	.....	.....	10,000
Hardwoods:							
Peruvian.....	47,000	51,000	.....	10,000	.....	140,000	248,000
United States.....	1,688,000	130,000	43,000	27,000	43,000	8,000	1,939,000
Other.....	20,000	.....	.....	.....	.....	.....	20,000
Total.....	31,040,000	3,480,000	3,467,000	3,534,000	2,094,000	1,204,000	44,819,000

SPECIES OF IMPORTED WOODS.

SOFTWOODS.

Douglas fir.—“Pino de Oregon,” the Spanish name applied to Douglas fir, cut and shipped from the States of Oregon and Washington, is the wood dominating all markets in Peru. Possessing strength, lightness, workability, elasticity, attractive figure, and other valuable properties, the wood answers for nearly every use for which lumber is required. It is conspicuously employed in competition with tropical woods for ornamental finish of furniture, fixtures, and high-grade interior trim and infrequently for the large, massive front doors characteristic of the Spanish architecture that prevails in Peru. It answers even for vehicle and car building, for which ash, oak, and other hardwoods are called on elsewhere. Douglas fir, in amount used, is the chief sash, door, and blind material, has become indispensable in mining operations, and is most suitable for innumerable uses on farms and plantations. Eighty per cent of all lumber entering into Peruvian commerce is Oregon pine. The not infrequent sight of two 12 by 12's strapped to both sides of the back and protruding far beyond the head and tail of a burro, the small

donkey used largely for transportation over the winding trails of the Andes, indicates how Douglas fir often reaches many interior points, farms, and mining operations in the mountain region of this Republic.

Redwood.—Redwood, the product of the forests of California, is held in high favor in Peru and apparently the demand is growing. In a few of the civic centers it is used by the sash and door factories and planing mills and in other lumber-working operations. If crossties used in Peru were included in the figures given for consumption, the importance of redwood would be many times increased. Over three-fourths of the railroad mileage of the Republic is said to be laid on redwood ties.

Spruce.—Of late years Sitka spruce, often called Western spruce, has made for itself a distinct opening in Peru, particularly in the Lima market. It was important at first as material for boxes, but the wood being on hand for inspection and trial, its color and other properties soon became appreciated and its uses were gradually but considerably extended. For instance, the musical-instrument makers, many of whom make by hand a few Spanish guitars and mandolins, prefer this wood to any other on the market because of its superior resonant properties. Puget Sound ports, near the center of production in the United States, are the origin of the shipments received in Peru. Cargo quantities are imported very infrequently; the major portion is ordered in small consignments, sometimes carried by steamers but more frequently by sailers in connection with cargoes of Douglas fir.

Southern yellow pine.—Long-leaf pine (*Pinus palustris*), usually referred to in the export trade as pitch pine, cut in the region of the Gulf of Mexico of the United States, constitutes most of the yellow-pine shipments to Peru. This wood bears the distinction of being most resistant to attacks of white ants of any of the woods on the market. It is held in high favor and used principally for the better grades of flooring, the construction of railroad and mining cars, boat building, and furniture. It is shipped only through New York, in parcel lots, by steamers carrying miscellaneous cargoes, and the heavy cost of transportation militates against its wider use. Another discouraging factor is sap-stain discoloration developing en route, which is rarely encountered in shipments of other American soft-woods and is seriously objected to by Peruvian dealers and consumers.

Cedar.—Spanish cedar, best known in the United States as cigar-box wood, grows in Peru east of the Andes in stands probably more abundant than any other forest tree. It is the same species that is cut in the forests of Brazil and used in that and other east-coast countries in larger quantities than any other lumber manufactured from South American woods. Except small lots carried out from the montaña, all the home-grown Spanish cedar cut into lumber in Peru is consumed in towns and districts of the Amazon Valley, principally Iquitos. It is said that this wood assumes the same commercial importance in those parts that Douglas fir does in markets west of the Andean ranges. The Spanish cedar that arrives at ports in the Republic on the Pacific and constitutes over 9 per cent of the cedar consumed is the product of Central American forests.

White pine.—The white and sugar pine lumber demand in Peru is small in spite of their superior qualities and particularly the local prices of the latter wood. It is said that the quantity required is not as large as formerly, because of the wider utilization of Sitka spruce and redwood for purposes previously met by white pine. Except for small quantities of Canadian and New England white pine imported occasionally up the Amazon to Iquitos, principally for boxes for marketing rubber, and inappreciable amounts sent to the west coast from New York, the entire demand is met by sugar pine (*Pinus lambertiana*) cut from California's forests. The best grades of sugar pine go principally for foundry models and patterns, furniture parts, and occasionally for door manufacture. Mediocre qualities are imported for making beer boxes and containers for reshipments.

Scotch fir.—The considerable quantities of Scotch fir, or northern pine (locally called pino Baltico), imported as box shooks are not included in the figures given for consumption. English and German corporations operating mines, railroads, and plantations in Peru occasionally purchase parcel quantities of this wood in connection with cargoes of other commodities shipped from Europe. It is not so common on the markets as in former years, having been almost entirely supplanted by American woods, largely sugar pine and Sitka spruce. The white pine commonly cut from the forests of Sweden (*Pinus sylvestris*) is the variety constituting most of the lumber imported from Europe.

HARDWOODS.

Hardwoods on the market in Peru include white and red oak, brown and white ash, yellow poplar, hickory, black walnut, and mahogany from the United States. Merchantable mahogany does not grow in American forests, but logs of the wood are imported, sawn there into lumber, and exported. Though roble means oak, Ecuadorian roble is not related to the North American oaks. The oak imported from Japan and used extensively in the Pacific Coast States of America is the same wood that Japan sends to Peru. Jarrah, the only wood contributed by Australia, is one of that country's most important species of eucalyptus.

DIMENSIONS.

The markets of Peru are distinct among those of South American countries as requiring lumber of no odd or special sizes. Fortunately for American manufacturers, dimension standards are identical with those of the United States. In building construction the sizes of rough structural and finish materials are the same as in the United States, and although considerable imported lumber is resawed and worked over, the final forms are seldom different from those common in America.

Compared with schedules of softwoods imported to other South American east and west coast countries, Peruvian cargoes of Douglas fir, like those going to Bolivia, run to considerable proportions of large sizes—6 by 6 up to 12 by 12 inches and 16 to 34 feet. These sizes, with 2, $2\frac{1}{2}$, and 3 inch planks, indicate the dimensions purchased by mines for lining installation. The large percentage of cargoes ordered of 4/4 with some little 2/4 material, in widths of 3, 4, and 6 inches, is

consumed almost entirely for further manufacture into milled products. The sizes making up the customary parcel consignments of spruce are deals, 6/4, 8/4, and 10/4 of standard lengths. Most of these are resawed and worked to finished commodities, such as boxes, ceiling, car siding, flasks, boat parts (skiffs), etc. Redwood and sugar pine always come to Peru in board and plank dimensions, conforming to standard sizes specified in recognized grades of these woods in the United States. Southern yellow pine (long-leaf pine) is ordered in flooring strips and timber sizes, the latter usually for car-building and lighter construction and certain exposed structural uses that demand greater durability than Douglas fir offers.

Not all the sizes common in American standard grading specifications of hardwoods are acceptable to dealers and consumers in Peruvian markets. The demand is almost invariably for 10 and 12 inch boards and plank, notwithstanding that much is bolted smaller in its uses, principally in further manufacture.

MEASUREMENTS.

The only system of measuring lumber, both in checking importations and in commerce generally throughout the Republic, is the English-American board rule. If lumber is invoiced in terms of the metric system, as is occasional with European consignments, in some of the ports the lighterage charge, based on the quantity of the invoice by cubic meters, figures more than 50 per cent above the equivalent in terms of board feet.

GRADES.

Douglas fir is in stock in Peruvian markets in three grades: "Clears," "selects," and "merchantable." The first-named is only rarely encountered, in small quantities, in 4/4 stock for best grades of flooring and stuff for furniture and fixture making. Selects are the common floor-strip grade, for which there is a large demand. The dealers report difficulty in securing it in the consignment proportions ordered. Merchantable is the quality of the miscellaneous and timber sizes constituting the run of the cargoes. Common does not figure separately in the fir grades of Peru's markets, though several rough uses are required of merchantable.

Redwood is imported only in uppers. Rough clear is the grade most often stated to be on hand, although material with sap, presumably "sappy clear," is seen occasionally included among the stocks.

The clear grades of sugar pine are those seen in the hands of various dealers. Selects were also reported.

Southern yellow pine has been sent to Peru in the "prime" and "merchantable" grades of the Gulf-coast standard classification. Because of the comparatively small difference between the two grades when yellow-pine prices are as high as they are in Peru, owing to high freights, the prime is the quality usually specified.

Hardwoods are demanded in Peru only in the best grade, "firsts and seconds." Much of this lumber used for cutting, as in furniture and door manufacture, could economically and practically be bought in grade "No. 1 common," if the matter were properly presented to the users. The use of this grade at lower prices would doubtless

make for increased consumption of all the hardwoods commonly imported to Peru.

Chilean rauli comes in only one grade, "firsts," which is free from all defects. Japanese oak and jarrah from Australia, as far as could be learned, are of no specified grades; they are mostly in dimension form of uppers for resawing.

OCEAN FREIGHTS.

Freights from lumber ports of the Pacific Coast States to Peru's ocean ports, under normal business conditions, run from \$9.70 to \$16.20 per 1,000 feet, board measure. From New York via the Panama Canal freight rates range approximately from \$22 to \$25 per 1,000 feet, with 20 per cent extra for long boards. Between Peruvian and Chilean ports the distance is covered in five days by steamer. Although Peru is nearer to the United States, lumber freights to the ports of this Republic are little, if any, less than those to Chile, because the direction of the trade winds requires sailors, the common form of vessel carrying lumber to west-coast points, to go to latitudes far south of Peru and then almost across to Australia before they can take the tack into Peru's harbors. The rates from Australia and Japan to this Republic are equivalent to about \$14 to \$20 per 1,000 feet, according to the kind of vessel; while from southern Chile the expense of carrying lumber to Peruvian ports in barks is \$8 to \$9.50.

Most of the lumber entering Peruvian ports comes from the Pacific coast of the United States. The fact that it is transported in both schooners and steamers explains the wide range of freights. All lumber from New York and from Japan is sent in general-cargo steamers. Australian hardwoods are usually transported on deck of sailers bringing coal to Peru.

DISCHARGE AND LOCAL TRANSPORTATION.

Discharge expenses in the several ports of Peru shown in the table on page 76 are mainly charges for handling and haulage in connection with lighters. The difficulty and responsibility of this business are considerable in times of rough weather. None but those who have had experience or have carefully made observations at various ports under changing weather conditions know of the skill and judgment often required and displayed by those who are unloading by this method. It is, in fact, surprising that there is not more loss and breakage, not only of lumber and lumber products, but of all classes of commodities. In packing goods for west-coast shipments, consignors can not give too careful attention to the strengthening and reinforcement of packages. It must be remembered that goods exported are usually not unpacked at their final destination, but are landed to be reshipped up and down the coast or overland by rail or otherwise. Cases, therefore, have to be subjected to rough handling with the sling several times, followed by continued rough treatment incident to canoe and pack transportation. An expensive piece of American furniture, a dresser, broken beyond repair on a wharf of one of the rivers of southern Chile, and the loss of 20 per cent of a 5,000-barrel consignment of cement left in bulk in lighters and on the wharf in Valparaiso speak eloquently of the need of making adequate packing the text for repeated admonitions to American

shippers. The loss of the goods damaged in shipment as a result of poor packing is not important as compared with the prejudice and unfriendly sentiment aroused by disappointment over the trade interruption or loss of business at destination, and with the effect on future business. Feeling is manifest against not only the individual exporter, but also the commercial United States.

At Callao lumber and wooden products, like other goods, are unloaded directly from the ocean vessel to the wharf. Discharge at this port includes, in addition to dock dues, slingage or winch charges, the equivalent of about \$1 per 1,000 feet.

There is the further expense of carrying the lumber from docks or mole by dock railroads, in some ports by mule carts, in others by manual labor, to its destination in lumber yards and deposits. This charge, applicable to every port, ranges from \$0.80 to \$1.75 per 1,000 feet, according to facilities and local customs.

None of the port cities of Peru is the metropolis of its commercial region. In southern Peru, Arequipa and Cuzco are inland 107 and 532 miles, respectively, from their port, Mollendo. Lima is 8 miles from the docks of Callao, and Piura is 46 miles distant from its port, Paita. An idea of the cost of rail transportation of lumber from seaports to the principal market centers of the several regions can be gained from the tariff shown for Douglas fir as follows: Mollendo to Arequipa (107 miles), \$9.60 per 1,000 feet; Mollendo to Cuzco (532 miles), \$15.20; Callao to Lima (8 miles), \$1.48; Salaverry to Trujillo (4 miles), \$1.05; Paita to Piura (46 miles), \$5.84.

Oregon pine enjoys the advantage over other softwoods of a rebate of 20 per cent from the principal railroads. Hardwoods are given a special classification, with rates at 25 to 33½ per cent higher than those on coniferous woods.

IMPORT DUTY.

Because it is dependent upon lumber cut in other countries for the entire national supply and recognizes lumber as a commodity essential to a country's commercial and social progress, Peru had not until 1915 imposed an import duty on rough lumber. This was a considerable factor in increasing consumption and lowering prices, and was therefore a great advantage to lumber producers in the United States. Moreover, it doubtless somewhat impeded the progress of materials used as substitutes for wood.

A law of December 29, 1915, placed an import duty of 10 per cent ad valorem on common unplaned lumber and on unworked cedar, which were formerly free of duty. There is also a special duty of 3 soles (\$1.46) per 1,000 feet on building lumber of pine, hemlock, larch, and similar woods. The ad valorem duties are to be replaced by specific duties based on the average prices of lumber before the war. The 10 per cent duty on lumber amounts to about the equivalent of \$2.64 per 1,000 feet. The opinion in trade circles is that the addition of this tax at a time when freights are exceedingly high will considerably reduce the amount of lumber imported and consumed in Peru.

Besides rough lumber other wood products on which the 10 per cent duty was recently imposed are crossties, telephone poles, piling, timbers and logs, firewood, and rough staves. Other manufactured

wooden products commonly imported are subject to duty at the following rates:

Articles.	Rates.		Condition.
	Soles per kilo.	Dollars per 100 pounds.	
Finished staves.....		0.01	0.22 Net weight.
Veneer:			
Or, ordinary.....		.08	1.76 Do.
Fancy.....		.16	3.53 Do.
Worred lumber.....		.14	^b 6.33 Do.
Match sticks.....		.02	.44 Do.
Parquet floorin'.....		.10	2.21 Gross weight.
Sash, doors, and blinds:			
Of ordinary wood.....		.12	2.65 Do.
Of fine wood.....		.25	5.52 Do.
Box shoo's.....		.01	.22 Do.
Chair-box lumber.....		.06	1.32 Net weight.
Washboards.....		.02	Gross weight.
Cloth boards.....		.08	1.77 Do.

* Per square meter.

b Per 1,000 feet board measure.

DELIVERED COSTS OF VARIOUS WOODS AT PERUVIAN PORTS.

South American countries have certain nominal, incidental port expenses exacted by the Government. In Peru they include such items as "port light dues," "hospital dues," "anchorage dues," "captain of the port's fee," "fee for customs visit," and "fumigation charges." These are all small in amount and, being considered the ship's expenses, are customarily defrayed by the captain. They are included in calculations reckoning charges of freights. At Callao there are additional charges, such as one for the use of wharfs. This is exacted not by the Republic but by the French corporation that built and conducts the operations of the docks under Government franchise. The dock charge is applicable whether boats dock or, as some do, anchor out and unload by lighters.

The variation in the cost of unloading and the c. i. f. prices of lumber in the several ports of Peru is inconsiderable, as is shown in the following table:

Kinds of wood.	Callao.			Mollendo.			Paita.		
	C. i. f. price.	Cost of dis- charge.	Total cost. ^a	C. i. f. price.	Cost of dis- charge.	Total cost. ^a	C. i. f. price.	Cost of dis- charge.	Total cost. ^a
Douglas fir:									
Merchantable.....	\$21.70	\$4.65	\$26.35	\$20.60	\$4.80	\$25.40	\$22.40	\$3.85	\$26.25
Select.....	26.35	4.65	31.00	24.80	4.80	29.60	27.10	3.85	30.95
Redwood.....	44.80	4.65	49.45	43.00	4.80	47.80	44.35	3.85	48.20
Spruce, Sitka.....	28.60	4.65	33.25						
Pine:									
Sugar and white.....	89.80	4.65	94.45	88.40	4.80	93.20	59.25	3.85	63.10
Southern yellow.....	55.40	4.65	60.05	54.60	4.80	59.40	39.30	3.85	43.15
Northern (Baltic).....									
Cedar, Spanish.....	42.30	4.65	46.95	44.95	4.65	49.60			
Hardwoods, United States.....	106.95	4.65	111.60	114.60	4.80	119.40			
Roble, Ecuadorian.....	68.55	4.65	73.20				51.00	3.85	54.85
Rauli, Chilean.....	72.80	4.65	77.45	77.60	4.80	82.40	79.45	4.85	84.30
Oak:									
Japanese.....	103.35	4.65	108.00						
Red and white.....	107.80	4.65	112.45						
Jarrah, Australian.....	78.50	4.65	83.15						
Ash, white and brown.....	105.75	4.65	110.40						
Walnut, black.....	206.55	4.65	211.20						
Mahogany.....	60.75	4.65	65.40						

* Exclusive of duty.

LUMBER-TRADE METHODS.

Lumber orders usually reach the mills in the United States through the medium of American exporting concerns, which also perform the function of importers in Peru, having branches in nearly all ports of this country. A very large portion of the Peruvian lumber trade is in control of one firm, which operates its own lines of steamships connecting both the Pacific Coast States and New York with Peru and other Republics farther south.

Among the users of lumber in Peru are companies conducting various extensive enterprises, mining, etc. A number of these often purchase Douglas fir and other lumber requirements in quantities of cargo shipments. Notwithstanding the opportunity that large orders give these consumers for direct dealing with producers in the United States, none, so far as could be ascertained, has direct dealings at present, nor desires to have them. The reason assigned by several is that since the importers have always managed prompt deliveries of most satisfactory material on a basis of an equitable margin of profits, the consumers prefer to continue their present connections rather than assume the responsibility and annoyance incident to international lumber shipments. This condition is the same in all regions of Peru, and in no country studied in connection with this investigation is the importation of American lumber carried on with fewer claims and disputes. This is significant in showing that under reasonable and proper conditions the exporter-importer performs not only a convenient service in export trading, but a function that is well-nigh indispensable. However, the business policies of commission houses with import branches along the west coast are radically different in the several countries. Practices and customs followed in one Republic in regard to lumber importation and trade are approved and upheld by consumers; in another, trade policies are different and are pronounced objectionable, being, apparently, in the interest of large profits rather than of increasing the volume of business.

MARKETING SYSTEM.

As in Brazil, but not in Argentina, Uruguay, and Chile, importers in Peru perform the sole function of middlemen or commission agents in international lumber transactions. They sell to dealers in cargoes and parcel quantities and to regular users of cargo amounts, such as corporations carrying on mining, farming, and railroading. The sales are usually on a basis of orders for future delivery; exceptionally few importers, if any, carry stocks, as is done in Chile, and conduct business along both wholesale and retail lines.

Lumber dealers in Peru may properly be classed into two branches. One class maintains strictly a lumber-yard business, selling retail what they import wholesale in consignments of a large variety of sizes. Concerns of this character are among those importing milled products. The other class, in connection with yards similarly operated, carry on a milling business and put up stocks resulting from resawing, planing, matching, jointing, and other woodworking operations. By these concerns lumber is imported in the few sizes that are most suitable for these operations. Woods purchased in timbers

and square logs, like cedar shipments from Costa Rica, hardwoods from Ecuador, etc., are cut into lumber by these industries. A number of dealers in this class go further into side-line manufacturing and, in separate departments, work at sash and door making, and at the production of furniture, chairs, fixtures, parquetry, pulleys, boxes, and coffins. The merchant dealers are the more numerous of the two classes. Their business varies in size from stocks of 20,000 to 2,000,000 feet. The second class probably controls a larger part of the Republic's trade. A number have extensive, substantial plants equipped with adequate and well-managed machinery facilities.

MARKET PRICES.

Retail prices per 1,000 feet in times of normal business may be seen in the following table; present prices show an increase of about 30 per cent:

Kinds of wood.	Lima.	Arequipa.	Piura.
Douglas fir (merchantable).....	<i>Per 1,000 feet.</i> \$32.00-\$41.60	<i>Per 1,000 feet.</i> \$50.00-\$54.60	<i>Per 1,000 feet.</i> \$36.00-\$42.00
Redwood.....	60.00- 73.00	87.00	.....
Spruce, Sitka.....	37.00- 40.00	.....	.....
Pine:			
Sugar and white.....	113.00-120.00	127.00-140.00	119.00-124.00
Southern yellow.....	70.00- 86.00	111.00	76.00
Oak, red and white.....	129.00-156.00	149.00-165.20	134.60-144.00
Ash, white and brown.....	129.00-142.00	157.40-165.00	134.60-144.00
Walnut, black.....	278.50-292.00	.....	.....
Cedar, Spanish.....	84.00- 92.00	68.00- 96.00	.....
Roble, Ecuadorian.....	76.00- 83.00	.....	60.00- 75.00
Rauli, Chilean.....	89.00- 95.00	90.00- 95.00	.....
Jarrah, Australian.....	92.00-106.00	.....	.....
Hardwoods, Peruvian.....	54.00- 68.00	48.50- 59.00	.....
Jenessara (West Indian oak).....	79.00- 84.00	.....	.....

Chapter III.—TRADE SENTIMENT AND TRADE EXPANSION.

TRADE SENTIMENT.

Efforts were made in this Republic, as in the other countries of South America, to ascertain the frequency and causes of claims or the existence of dissatisfaction over imports of American lumber. From interviews with importers and dealers in five of the eight important consuming regions, the conclusion was drawn that complaints are few and unimportant and the sentiment of the trade is decidedly favorable to American manufacturers and exporters. The situation as a whole is characterized by less friction, local and international, than that of any of the other Republics investigated up to this time.

Most of the complaints against Douglas fir consisted of objections to wide-ringed or coarse-grained material. This was not cited as an infringement of the rules of standard grading but as an instance supporting the opinion of several that the gradually increasing ratio of this stock in cargoes indicates a lowering of grade standards. The opinion was expressed that the subject of coarse grain should be given attention by those in charge of the revision of inspection rules. A few Peruvian dealers separate the coarse-grain stock of incoming consignments and sell it cheaper as a special grade, term-

ing it "No. 2." More complaint of too large a percentage of the wide-ringed material was heard in connection with cargoes from the Columbia River region than with those clearing from Puget Sound ports. No objections were made to Douglas fir as to uniformity in standard defects, nor had any difficulties arisen on the ground of discoloration developing in transit, a subject that was specially investigated.

Check measurements of Douglas-fir cargoes from time to time have shown discrepancies from invoice amounts, but none were sufficiently large to warrant a claim for adjustment.

Redwood and sugar pine were both given a clean bill of health, not a protest nor objection of any character being cited. Sitka spruce in stock was examined and found comparatively free from sap stain and otherwise apparently in satisfactory condition. It is well for exporters and manufacturers of spruce to heed the caution to send well-conditioned lumber to Peru. The prospects for increased consumption of this wood are bright and special care should be exercised at this juncture to prevent the arrival of discolored or blackened lumber that would create a prejudice among consumers.

Against southern yellow pine there has recently been reported one claim, due to sap stain supposed to have developed during the long voyage via Magellan Straits. That this wood is generally favored in Peru is proved by the demand for it in competition with fir, at a price more than twice as high. With the opening of the Panama Canal, there is opportunity to lower the prices and thereby augment the sales of southern yellow pine, provided continued shipments do not increase the prejudice, characteristic of South American lumber markets, against discolored or fungous-stained material.

The most serious general criticism of American products was aimed at hardwoods. It is claimed that duplicate orders for the same grade invariably bring different qualities. That this complaint is a repetition of objections expressed by dealers in every other country of South America visited in connection with lumber investigations is a fact that emphasizes the necessity of immediate corrective measures on the part of the American hardwood industry.

PROSPECTS AND SUGGESTIONS FOR TRADE EXPANSION.

For the United States to study lumber-trade expansion in Peru, where at present all but a small percentage of the country's consumption is of American production, appears unnecessary. One would naturally contend that in international trade it is possible to furnish only up to the limit of a nation's needs. Efforts to do more lead to situations of overstocking or increase of present business at the expense of future trade. But present requirements and consumptive capacity are two distinct factors. The former is established and tangible; the latter develops as the result of demonstration and experiment. In other words, one buys in larger quantities when convinced that he can utilize the increase to advantage. Further, his demand becomes continuous and distribution is specialized, as he sees empirically the spheres of usefulness in which the material in question is equal to or better than competitive materials. This summarizes the state of the lumber markets of Peru and indicates the method of treatment to be followed by American lumbermen if trade is to develop.

NEED OF LUMBER-PUBLICITY CAMPAIGN.

Peru has never had exploitable timber. Lumber supplies have not been at hand, as they have in many other countries, to meet almost every need and to be wasted in learning lumber's great utility. Where other nations have had this advantage in their earlier stages, Peru has had to employ stone, clay, and adobe products, bamboo, etc. Peruvians are not natural wood users and have turned to its employment only to the extent that they have learned from foreigners immigrating or residing within their midst. Many in the United States, manufacturers and others interested in lumber and timber subjects, know the need even there of public enlightenment on matters concerning wood utilization. The need of education along similar lines is much greater in Peru, where lumber stands on the same plane with competitive materials. Publicity, making common property facts concerning lumber's utility and adaptability, is the important need of Peru's market, and a publicity campaign must be undertaken by American lumbermen if the United States is to develop this Republic as an extension of its domestic lumber markets.

Extensive publicity work is what has brought signal successes to certain American products in South America. The sewing machine made in the United States is seen in nearly every home in Peru and other Republics as the result largely of class instruction. An invitation is open to all in these Republics who wish to learn machine sewing. The privilege is not conditional on promise to buy, because business inevitably follows the instruction. The American cash register is almost as common a store fixture in South America as at home. Advertising literature attractively gotten up is distributed and paves the way for the request to place a machine on trial. This is known as the Yankee scheme, but it is the same principle of publicity, and sales follow demonstration. The Standard Oil Co. of America gives away lamps to prove the superiority of oil over the still widely used tallow candle and lard torch. The resultant increase in business, it is said, comes in demands from most remote corners, and natives travel afoot days' journeys to obtain supplies. The lumbermen of the United States can not awake too soon to their obligations in this regard in connection with Peru and the other principal South American countries. The propaganda work in South America is their work because they know what local dealers and importers do not know about the properties of American woods and the uses of lumber, and they are, moreover, in possession of effective methods of distributing information.

In furthering publicity, advertising should be made one of the principal measures, and advertising can not be directed at long range from the United States to Peru. To reach the consumer, the work must be undertaken on the ground and along lines characteristic of the country.

Publicity is necessary not alone to present the merits and adaptability of wood but to refute the arguments of the handlers of substitute materials. Trade representatives of American and European cements, steel products, composition roofing, substitute boxes, metal furniture, etc., are working in Peru, and all but the last two are permanently organized. In the interest of lumber there is no similar movement in any South American Republic. The dealers are left to



10. PRODUCTS OF A LIMA FURNITURE FACTORY.



11. FURNITURE MADE IN PERU FROM AMERICAN HARDWOODS AND SPANISH CEDAR.





12. INTERIOR PATIO, STUCCO FINISH, OF A MODERN CONCRETE BUILDING IN LIMA.



13. A TYPICAL BUSINESS AND RESIDENCE STREET IN ONE OF THE COAST TOWNS OF PERU. EXCEPT FOR WOODEN DOOR AND WINDOW FRAMES AND BALCONIES ALL THE BUILDING MATERIAL IS ADOBE.

create demands and the public to find out the truth about wood as best they can. Even the importers render little aid, because they usually handle steel, wood, and cement. If profits are equal and business materializing, it makes little difference which commodity is handled. An organization representing American lumber associations should study the situation and cooperate with dealers and importers throughout Peru in general propaganda, using form letters, circulars, newspaper and illustrated advertisements, lantern slides, practical experiments, and window displays, and personally meeting competitive arguments and conducting inspections in the interest of wood uses for factories making wooden products as well as important industrial enterprises employing lumber incidentally. In line with this work there should first be prepared, for the information of dealers, architects, and other interested persons, circulars in English, Spanish, and German presenting brief but reliable discussions of subjects such as the following:

- (1) The adaptability of wood in building construction and the merits and relative cost of homes built of wood.
- (2) The strength of various woods, how to judge strength, and the properties of wood compared with those of other materials.
- (3) What causes wood to rot and how to prevent decay.
- (4) Why lumber checks, warps, and shrinks, and measures taken to overcome these tendencies.
- (5) Modern economical methods of woodworking.

CREATING A DEMAND FOR WOODEN HOUSES.

No one fact arrests the attention of a traveler in Peru and adjacent Republics more than the absence of wooden houses, evidently due to the influence of Spanish customs and architecture. At prevailing prices of lumber in these countries the wooden residence would prove a considerable economy over the brick-stucco and concrete construction universally employed. No movement could be more to the interest of the economic and social welfare of the several Republics than the building of cheaper homes. Under present conditions of high expense of living and building, few in moderate circumstances can aspire to own a home. The frame house, along the lines of the American cottage and bungalow, would doubtless tend to change this custom if it could be attractively brought to the attention of the public.

Model homes of varying prices might be placed not only in several of Peru's cities, but in those of Chile, Argentina, and Uruguay. Pictures of bungalows and cottages as they stand in the United States, appearing as advertisements with prices for reproduction and other pertinent information in local journals, might prove educational and in time commercially effective. Likewise, public offers by dealers or others to submit free for inspection and, if desired, for use, building plans and the lumber bills for homes in cities or on farms would arouse interest in prospective home builders. There would also be a place in this movement for the ready-cut houses and in temporary uses for the knockdown portable houses, both widely regarded in the United States, if their merits are judiciously presented and kept before the public attention.

To American lumbermen this home-building subject is vitally important just now. The South American republics, with their varied natural resources, with the opening of the Panama Canal, and with the settlement of international political differences, are anticipating an era of commercial development. Extensive building is bound to ensue, which will include a large demand for homes.

GENERAL SUGGESTIONS.

With this study completed, the lumber investigation in the southern continent has covered the five Republics of Argentina, Uruguay, Brazil, Chile, and Peru. All five Republics send the same double challenge to the lumber industry in the United States: "Deliver the goods," and "Show me." Increased sales of United States lumber on the southern continent depend upon the extent to which these demands are heeded. The first means filling orders accurately and delivering lumber properly conditioned, accurately measured, and uniform in grade. The second involves trade extension by education and demonstration, making salesmen of facts. To these two factors even credits and American banking facilities, so widely discussed by economists studying in South America, are secondary.

Nothing could further the export lumber trade of the United States more than the export associations that have been proposed, if such associations should be found feasible. If the membership comprises a large majority of the mills cutting for export and if the associations deal with trade extension as well as regulate prices, the movement will prove of inestimable benefit to the United States in marketing export lumber.

Chapter IV.—PRINCIPAL USES OF DOMESTIC AND IMPORTED WOODS.

No fact connected with the lumber industry in Peru stands out more prominently than the overwhelming predominance and the multifarious uses of Douglas fir. The situation makes it readily apparent that using one kind of lumber for a great many purposes does not tend to increase the utilization of wood, since recommending lumber for purposes to which it is not best adapted diminishes the demand and impairs public confidence. To anyone having an ordinary acquaintance with the properties of different woods and their uses in the United States, it would appear obviously out of place to see hubs and other wheel parts made of Douglas fir when elm, hickory, and white oak were available, or parlor furniture made of hemlock if birch, walnut, or mahogany were on the market, or shingles of maple instead of the lasting cypress or the durable white and western red cedar. Not all these instances were actually observed in Peru, but they are typical of misuses that were noted. In South America first cost is generally the sole qualification considered in purchasing lumber. Because knowledge of the physical properties of different woods is limited, few realize that it is economical to buy a high-priced wood if it is several times as suitable as a wood that costs

half as much. It is obvious that until such understanding is promoted by an organized effort to instruct the wood-using public, it is not possible to expect market openings for American woods that are little known or that do not appear among kinds at present imported. As far as woods of different kinds are known and employed, wood utilization in Peru is similar to that in the United States. The varieties on the market and the standards of grading and measurements are largely American, and in manufacture not only the machinery employed but the patterns and designs produced are in line with those used in the United States. In building construction more wood is used for exterior work in Peru than in Argentina, Uruguay, or Chile, in spite of frequent destruction by wood insects that are not prevalent in the other Republics. Lath and plaster partition are used no more in this Republic than in Brazil and Argentina. Peru uses more wood partition than either of these countries, but apparently not as much as Chile. As is customary in South America, the ceilings in Peru are almost entirely of wood, either in worked and matched forms or in panel work. Doors and windows of Peruvian designs are numerous and of large dimensions. Consequently more wood is required for them than would be needed for openings of similar size and character in a building in the United States.

The following table gives the principal uses not previously mentioned of different woods in Peru:

Buildings, rough construction:

Douglas fir.
Southern yellow pine.
Ecuadorian roble.
Spanish cedar.

Flooring:

Douglas fir.
Chilean rauli.
Southern yellow pine.
Jarrah.

Ceiling, partition, etc.:

Douglas fir.
Redwood.
Spanish cedar.
Sitka spruce.
Chilean rauli.
Scotch fir.

Molding, paneling, interior trim:

Douglas fir.
Spanish cedar.
Redwood.
Chilean rauli.
Southern yellow pine.
American oak.
American ash.
Ecuadorian roble.

Patterns and flasks:

Sugar pine.
Redwood.
Northern white pine.
Douglas fir.
Yellow poplar.
Scotch fir.

Piling and dock timbers:

Douglas fir.

Sash, door, and blinds:

Douglas fir.
Redwood.
Spanish cedar.
Sugar pine.
American ash.
American oak.
Sitka spruce.
Peruvian hardwoods.
Ecuadorian roble.

Plastering lath:

Douglas fir.
Car construction:

Douglas fir.
Southern yellow pine.
American oak.
Redwood.
Yellow poplar.
American ash.
Spanish cedar.
Sugar pine.
Mahogany.
Ecuadorian roble.

Boxes and crating:

Douglas fir.
Sugar pine.
Scotch fir.
Chilean laurel.

Boatbuilding:

Douglas fir.
American oak.
Southern yellow pine.
American ash.
Sitka spruce.
Spanish cedar.

Tanks, vats, and barrels:

American oak.
Chilean rauli.

Cornice, porch, and exterior house-work:

Douglas fir.
Redwood.
Sugar pine.
Scotch fir.

Crossties:

Redwood.
Douglas fir.
Chilean roble.
Chilean cypress.
Jarrah.

Trunks:

Douglas fir.
Sitka spruce.
Yellow poplar.

Telegraph poles:

Douglas fir.
Chilean mafio.

Furniture, finishing:

Spanish cedar.
Mahogany.
American oak.
Butternut.
American ash.
Black walnut.

Furniture, finishing—Continued.

Southern yellow pine.
European oak.
Peruvian hardwoods.
Douglas fir.
Ecuadorian roble.
West Indian hardwoods.

Furniture, interior:

Redwood.
Spanish cedar.
American oak.
Douglas fir.
Sugar pine.
Sitka spruce.

Vehicles:

American oak.
American ash.
American hickory.
Douglas fir.
Spanish cedar.
Southern yellow pine.
Yellow poplar.

Coffins and caskets:

Douglas fir.
Spanish cedar.
Redwood.
American oak.
Black walnut.

USE OF WOOD HAMPERED BY PREVALENCE OF TERMITES.

A natural agency working against the wider application of lumber in commercial use in Peru is the destruction wrought by termites, or white ants, in Spanish commonly called pollia. These insects, after developing wings at a certain season of the year, fly often over long distances to lodge in wood, whether it is in buildings, in movable commodities like vehicles, or dead in the forests. Evidence of the wood-eater's work is seen in all parts of Peru up to altitudes of 11,000 feet or more. They hollow out the panels of ornamental front doors, dig their way through piano cases, damage costly furniture, and honeycomb floor boards. At mills and lumber yards several lower layers of piles of long standing show the furrows where the spring wood is eaten away in nearly every board or plank. Any information available in the United States as to preventive treatment of wood or measures calculated to lessen termite injury could be most profitably applied to further the marketing of American lumber, if printed in Spanish and English and sent to Peru for distribution.

IMPORTANT USERS OF LUMBER.

Among the largest lumber consumers in Peru are the mines, farms, and railroads. The mines, besides employing lumber for rough construction and finish of buildings, equipment parts, and temporary uses, require immense quantities in mining operations for lining—sills, posts, caps, and lagging—of shafts and lateral openings. A single mining concern reports the annual purchase of 6,000,000 to 8,000,000 feet. In running the large sugar and other plantations with the several collateral operations heretofore described, lumber is needed constantly for houses and farm buildings, factories, and general

farm uses. In the aggregate the consumption of the active haciendas, without considering small farms, is large.

Peruvian railroads require lumber in no small amount for maintenance and construction. The mileage of track operated is nearly 2,000, while that started and authorized for early construction equals almost 700 miles. A number of the Republic's railroads are under one administration, an English corporation with English and American capital. This company maintains several inextensive but well-equipped woodworking shops, where both car building and repairs are carried on. Similar enterprises on smaller scales are conducted by other roads, including private lines. Practically all the lumber used is from the United States.

WOOD-USING INDUSTRIES.

Manufacturing in Peru has been little developed in spite of the availability of abundant cheap labor and varied raw materials. Opportunities for activities of this character, apparently favorable, will doubtless attract more serious attention when Peru is in closer touch with the world's markets through the operation of the Panama Canal.

Furniture factories; planing mills turning out the usual milled products and sash and doors; several car-building and repair shops, a match factory, yards for building lighters and barges, and box-making and cabinet shops constitute the limited woodworking operations of Peru. Several of the planing mills and a few furniture factories are fair-sized undertakings. They have up-to-date machinery, mostly American, and turn out commendable products. The rest of the industries, except car shops, use only a small amount of lumber and are even less important except for meeting limited local demands, than factories and mills making other commodities that use wood only incidentally, such as distilleries employing boxes for packing containers of alcohol and the wine, rum, and beer makers putting up their products in wooden barrels or in bottles packed in wooden cases.

CROSSTIES.

Two sizes of sleepers are customarily used in Peru; one is 6 by 8 inches by 8 feet, for the usual standard-gauge track, and the other 4 by 6 inches by 5 feet, required for several narrow gauges (largely the 3-foot, 3-foot 3-inch, and 3-foot 6-inch). There is also considerable demand for the smaller size for the extension and maintenance of private roads, such as are in operation on large sugar and rice estates and about principal mining properties, and for short branches and connections with main lines.

American woods have been furnishing probably 90 per cent of the total supply of crossties in Peru. The rest of the trade goes to Chile.

Redwood is the principal crosstie material in this Republic, where its position is similar to that of quebracho in Argentina, roble in Chile, and white oak in the eastern United States. Redwood is favored not alone because it furnishes a durable, resilient sleeper that is little inclined to check and holds spikes well, but because, of the

number of tie woods experimented with, it proved insect-resisting to an extent pronounced satisfactory. Douglas fir is the second most common sleeper, its greatest demand coming from privately owned railroads. It is lower in first cost but untreated does not make for economy in soil contact. Experiments with treated Douglas fir have shown that the presence of creosote oil in ties prevents insect destruction. However, in regions where insects are not so formidable a foe of wood as in eastern Peru, the advantage of treated sleepers over redwood is not regarded as sufficient to justify the increased outlay.

Chilean roble is prized in Peru for crossties on account of its spike-holding qualities and fair durability. Being very hard, it shows rail abrasion less than any other wood in use. Its exceptional weight is the handicap, enhancing transportation and handling costs to the extent of putting the final price above that of redwood. Chilean cypress, in use only a few years, seems not to attract wood-devouring insects as do Chilean roble and Douglas fir. As far as experiment has gone, this wood is favorably regarded by the railroads. It is nearly as light in weight as redwood, yet not so soft, is fairly stable as to checking, resinous, of known durability in regard to insects, and a little less costly than redwood. The chief objection is the frequency of knots, one of the well-known characteristics of cypress. Cypress is not yet generally known in Peru as a crosstie material; if it proves desirable for that purpose, it will be necessary to seek the answer to the heretofore unconsidered question, whether cypress ties can be had in proper dimensions and quantities desired. The habitat of cypress is situations high on mountain sides in Chile, mostly far distant from transportation. Except on limited areas relatively near-by, extraction from forests will doubtless be found costly and arduous.

The c. i. f. cost per piece of redwood sleepers, in cargoes, with normal freights applying, are, for the larger size mentioned, \$0.87 to \$1; for those of smaller dimensions, \$0.73 to \$0.84. Chilean roble crossties of the standard-gauge size are sold c. i. f. in Peru at \$0.82 to \$0.95, and of the narrow-gauge dimensions at \$0.72 to \$0.78. Before the war cypress ties were quoted at \$0.78 and \$0.66, respectively, for the two sizes.

The number of crossties imported into Peru during 1912, 1913, and 1914 is shown, by ports, in the following table:

Regions.	1912	1913	1914
Callao.....	196,112	91,230	89,637
Mollendo.....	37,837	45,400	108,080
Paita.....	25,253	95,081	-----
Salaverry.....	17,988	99,335	100,888
Eten and Pacasmayo.....	11,460	13,685	288,961
Ilo and Pisco.....	2,005	11,754	7,244
Total.....	290,755	356,485	594,810
From United States.....	290,521	308,471	567,378
From Chile.....	234	48,014	27,432

BOXES AND SHOOKS.

There is no basis for a reliable estimate of the amount of lumber annually going into making boxes and crates in Peru. The largest

quantity is consumed in resawing and in bolting shooks from deals and lumber sizes. In several markets shook cutting, with the usual supplemental operation of box making—assembling shooks, nailing them, and stenciling—is fairly important among the wood-using industries and offers a good profit. For this work modern machinery devices are in use. Sitka spruce and Douglas fir are the woods employed almost exclusively; the former is favored, though its price is considerably higher.

Ready-made shooks, bundled and often stenciled, are imported. They are sold to large users in consignments ranging from 3,000 to 15,000 boxes. The duty is ordinarily 0.01 sol per kilo (about two-fifths of a cent per foot board measure); shooks brought in only to incase goods for export are exempt from duty. The United States has not controlled shipments of shooks to Peru in nearly so large a proportion as those of lumber, ties, staves, and other wood products. The major portion is to be credited to the United States, but Europe, principally Great Britain and Germany, has for a number of years been contributing 30 to 60 per cent of the imports. The total quantity of imported shooks is not large; in recent years it has been as follows: 1912, 1,100,000 feet; 1913, 1,230,000 feet; 1914, 1,040,000 feet.

Scotch fir, or northern pine, is the wood of which most European shooks are made. It is strong in proportion to its light weight and holds nails well, is not inclined to split nor check, and has the favored color for wood packages. Mixed western pine or California white pine and sugar pine are the woods of which the largest part of the competing American shooks are made. Tupelo and sap gum from the region of the Gulf States furnish the rest. Because of their desired properties and lower prices, these American woods have gradually supplanted the European shooks.

With the advantages the present war gives to American commerce in South America, the shook mills in the United States should not find it hard to capture the remainder of the Peruvian import trade. Chile has been making strenuous efforts to introduce shooks cut from laurel. They are offered cheaper than the California pine, but the samples shipped had been recently cut from green wood and showed the susceptibility of laurel to excessive checking, with the result that an unfavorable impression was created which it will take time to eradicate.

Besides the boxes required for general business uses in Peru, the largest demands originate with the alcohol distilleries, candle and soap factories, and wine makers shipping bottled goods. These industries are the chief users of imported shooks. The plantations buy in the largest numbers for cases for tins holding 22.71 liters (about 6 gallons), the receptacle used in marketing vast quantities of alcohol produced in connection with the Peruvian sugar industry. The necessary sizes of shooks for alcohol boxes are as follows: Ends, $\frac{1}{2}$ by 9 by $12\frac{1}{2}$ inches; sides, $\frac{1}{2}$ by 9 by $14\frac{1}{2}$ inches; top, etc., $\frac{1}{2}$ by $13\frac{1}{2}$ by $14\frac{1}{2}$ inches. The comparative c. i. f. prices per box were reported as follows: Bundled shooks, Scotch fir, \$0.22 to \$0.24; bundled shooks, sugar and California pine, \$0.17 to \$0.19; Sitka spruce cut in Lima, \$0.16 to \$0.18, plus freight.

Candles are still one of the principal means of illumination among the poor and throughout Peruvian rural districts. Large quantities are manufactured and distributed wholesale in wooden boxes made of

tupelo, Douglas fir, or Sitka spruce. The last two, used in the largest quantities, are put into homemade cases; the first are imported in shook form and cost \$0.08 to \$0.11 c. i. f., according to the several sizes used, which are as follows:

Ends.	Sides.	Top.
<i>Inches.</i>	<i>Inches.</i>	<i>Inches.</i>
1 by 6 by 9 $\frac{1}{2}$.	1 by 6 $\frac{1}{2}$ by 9 $\frac{1}{2}$.	1 by 9 $\frac{1}{2}$ by 9 $\frac{1}{2}$.
1 by 6 $\frac{1}{2}$ by 7 $\frac{1}{2}$.	1 by 6 $\frac{1}{2}$ by 9 $\frac{1}{2}$.	1 by 7 $\frac{1}{2}$ by 9 $\frac{1}{2}$.
1 by 6 $\frac{1}{2}$ by 8 $\frac{1}{2}$.	1 by 6 $\frac{1}{2}$ by 10 $\frac{1}{2}$.	1 by 8 $\frac{1}{2}$ by 10 $\frac{1}{2}$.
1 by 9 $\frac{1}{2}$ by 9 $\frac{1}{2}$.	1 by 9 $\frac{1}{2}$ by 12 $\frac{1}{2}$.	1 by 9 $\frac{1}{2}$ by 12 $\frac{1}{2}$.
1 by 8 by 8 $\frac{1}{2}$.	1 by 8 by 12 $\frac{1}{2}$.	1 by 8 $\frac{1}{2}$ by 12 $\frac{1}{2}$.

FLOORING AND CEILING.

Nearly all flooring, ceiling, partition, and wainscoting consumed in Peru are homemade. Milled products are imported mainly in high-priced stock or for use in regions remote from planing-mill machinery. The quantity of planed lumber brought in from foreign sources, therefore, is not extensive. Of these imports, Douglas-fir flooring, grades No. 1 and No. 2, constitutes the major portion. Very small amounts of southern yellow pine and hardwoods from the United States make up the rest.

The duty imposed on planing-mill products like those discussed is 0.14 sol per square meter (\$6.33 per 1,000 feet). This is further increased by customary dock tolls and other discharge expenses reckoned in connection with regular lumber imports. The prices of Douglas-fir flooring c. i. f. in times of normal business are as follows: No. 1 grade, \$33 to \$35, and No. 2, \$30 to \$33 per 1,000 feet. Southern yellow pine, "B and better" quality, sold for \$72 to \$75 per 1,000 feet.

Considerable flooring and ceiling are made in Peru from the best Douglas fir selected from incoming "merchantable" consignments, much of which is above grade. The largest portion of the total planing-mill production, however, is worked from 4/4 stock of "select," "clear," and "clear vertical grain" Douglas fir imported especially for this line of manufacture. Peru is the only country in South America in which edge-grain flooring, either homemade or imported, was observed standard on the markets. The retail lumber industry in other Republics would further lumber sales if it followed Peru's example in this regard.

Southern yellow pine flooring is popular in the higher grades for the wood's superior wearing qualities and resistance to insects. Nothing but the high price of this wood, due to high transportation cost, via New York, prevents its wider employment. Like Douglas fir, yellow-pine flooring material is brought to this country in the form of 4/4 strips, 3, 4, and 6 inches wide. Kiln-dried yellow pine is invariably specified.

Rauli, the wood widely used for flooring in Chile, finds a limited demand in Peru as a high-priced flooring. It is imported in rough boards, usually 10 inches wide, and bolted and worked after arrival. The most exacting use of Australian jarrah is likewise expensive flooring, but entire floors constructed of jarrah are rarely encountered;

it is most used in combination with alternate boards of southern yellow pine. The color contrast between the deep, dark reddish jarrah and the light-hued, even-grained yellow pine, mostly tangential cut, is popular and is frequently seen in stores, hotels, clubs, churches, hospitals, and front halls of residences.

Parquet flooring used in Peru, like the planing-mill products, is largely the output of home industry. An impetus to the demand for tile flooring is the result of the recent establishment of a manufacturing plant in Lima, turning out most creditable colored, plain and fancy, and enameled tile. Tile flooring up to this time has apparently not been so popular in Peru as in Argentina, Brazil, and Chile.

The retail prices of standard kinds of flooring in Peru, according to several largest markets, range as follows: Douglas fir, \$47 to \$65 per 1,000 feet; southern yellow pine, \$87 to \$95; rauli, \$90 to \$110; jarrah, \$98 to \$125; parquetry, \$195 to \$260; tiling (cement and composition), \$185 to \$235 per 1,000 superficial feet.

SASH, DOORS, AND BLINDS.

The duty on sash, doors, and blinds of ordinary woods imported into Peru is 0.12 sol per kilo (\$0.027 per pound), gross weight. The handicap of this tax, it is claimed, accounts for the relatively small imports of these manufactured articles. The business of supplying this inextensive demand goes entirely to factories in California and Washington.

The making of sash and doors, in connection with the manufacture of other articles constituting general millwork, is the most important wood-using industry in Peru, from the standpoint of capital invested, value of production, factory equipment, and labor employed. The industry is being encouraged not alone by the protection of Government imposts but by trade agreements among lumber dealers to handle only homemade products. This has been further an impetus to the distribution of woodworking machinery, mostly of American make. As in other South American countries, sash and doors in Peru are not manufactured in quantities for stock requirements, owing to the prevailing custom of constructing sash and doors only to order for particular jobs.

Redwood is growing in favor as a Peruvian sash and door wood, but so far its common use is confined to several large markets. The fact that it shows little tendency to shrink and its workability particularly commend it for these uses. Southern yellow pine finds a limited demand at very high prices because it resists termite attack.

In quantity consumed, Douglas fir is the popular raw material for local sash, door, and blind manufacture. These products are the cheapest on Peruvian markets, yet their increasing production signifies success in meeting the large demand. The most exacting use for Spanish cedar is in making these commodities. It is employed more extensively than redwood but for better-grade sash and doors. The wood's aromatic odor is regarded as chiefly accountable for its ability to withstand destruction by white ants. The characteristic rich, reddish color of Spanish cedar, closely imitative of old mahogany,

together with the width of the lumber and its softness, makes it more popular than any other wood for the massive ornamental, often elaborately carved, front doors that are highly favored for city residences in countries with Spanish customs.

Sash and doors are sold usually as part of millwork contracts. Prices in Peru, therefore, can be only generally indicated, as this sales method, together with variations in patterns, sizes, kinds of wood, and cost of manufacture in the several markets, allows no basis for standard quotations. Builders calculate approximate cost per square meter (10.76 square feet) of opening. Doors range from \$3.20 to \$6 and windows from \$1.83 to \$3.50 per square meter. These prices do not include glazing, but it is the trade custom to include interior blinds and frequently hinges.

ECUADOR.

INTRODUCTION.

To American lumbermen Ecuador is significant as the country in South America where lumber cut from United States or Canadian forests is not found among regular stocks of any of the Republic's lumber markets. Further, no woods grown even in neighboring Republics nor in oriental or European countries are imported. An exception might be cited of small parcel consignments infrequently received by private users, mostly from North America, to answer for particular purposes to which native woods can not be made to apply. The major portion of these imports are ordered in connection with Government work, for railroad use (car repairs, etc.), or for other public-service and private corporations holding by franchise rights exemption from tariff charges. These conditions present a remarkable contrast to the lumber markets of the adjoining Republic, Peru, to which the United States ships 40,000,000 feet annually, or over 90 per cent of the total demand, and the markets of Chile, half of the lumber requirement of which is cut in North America.

Although Ecuador is the smallest of the west-coast countries of South America, and is less developed politically and industrially than Peru and Chile, owing first to geographical difficulties and secondly to comparative isolation because of the reputed insanitary conditions at the port cities, this country must not be regarded by Americans as an unimportant field for foreign-trade expansion in any line of export business. The United States has been offering a ready and increasing market to the largest portion of Ecuador's exports, the total of which averages approximately \$14,000,000; but in supplying the imports the United States is and always has been surpassed by England, and followed none too remotely by Germany and France, each of which enjoys a fairly large percentage of the total. The average of the imports annually approximates \$10,000,000.

During the period of financial stringency recently felt throughout South America and the commercial depression resulting from the present European war, Ecuador seemed less affected than any other country of the southern continent except Uruguay. Certainly Guayaquil showed, relatively to its population, more commercial activity than any other South American city visited by the writer, and the reports received from business men generally indicated satisfaction with present trade and decided optimism for the future. While it is true that with the advantages given to American exporters by the Panama Canal, the gain of increased trade in Ecuador will be comparatively limited, at the same time the Republic, besides possessing many excellent opportunities for the development of varied and rich natural resources, doubtless has considerably more internal commerce than is the general impression outside of the country.

Chapter I.—GENERAL DESCRIPTION AND FOREST RESOURCES.

The forests of Ecuador are the Republic's greatest asset. Among the country's chief articles of export are cacao beans, from which chocolate is procured, Panama straw hats, ivory nuts, and rubber, all of which are forest products. Geographically, as well as by characteristic tree growth, the Republic can be divided into three parts. East of the Andes is the region subject to heavy rainfall with an unmeasured expanse of green forests. The paramo, or lofty parts, of the cordilleras and the intermountainous section comprise the Andean region, while the lower western slopes, with the moist parts of the littoral, and the remainder, spoken of as the arid coast zone, constitute the tidewater, or coast, region (sometimes called the western region).

WESTERN REGION AND ITS COMMERCIAL PRODUCTS.

Most of the timber woods are found in the western region. The mangle grows here in abundance, skirting the streams and inundated sections. Besides lumber, this tree furnishes the bark that is known in English-speaking countries as mangrove bark. The ceibo not only is used for cheap lumber but produces a soft fleece-like substance esteemed widely for various articles of commerce. Among the more valuable trees for cabinet woods are guayacan, pechiche, ebano, roble, figueroa, laurel, coquito, and quiebra hacha, or quebracho (unrelated to the valuable quebracho in Argentina). In the southern part of this region is found, it is said, the balsamo del Peru (*Myrospernum peruiferum*), a resinous wood; la moscora, a common name for one of the many palm trees (the leaves of this particular one provide the sturdy cords for making the excellent hammocks characteristic of Ecuador); and the damajagua, which yields the fibrous inner bark valued by natives for clothing and bedding.

Two notable plants in this region, which are sources of considerable wealth to Ecuador, are the toquilla (*Carludorica palmata*) and the cadi (*Phitelphas macrocarpa*). Although they resemble palms, they belong botanically to a different family, namely, Cyclanthaceæ. The toquilla furnishes the straw for Panama hats, the most valued manufacturing industry of the Republic, the exports of which amount annually to over \$1,000,000. It is claimed that Ecuador originated this form of hat, and although similar manufacture is carried on extensively in near-by districts of Peru, and to a small extent in western Colombia and several other South American countries, Ecuador furnishes nearly all the toquilla straw and Ecuadorians have been called on as instructors. Native weavers in Ecuador refer to the toquilla straw as cuencas. The weavers do their work by hand in the early morning because the greater atmospheric humidity at that time makes the straws more pliable and readily manipulated. Weaving under water, which, outside of Ecuador, seems to be generally considered essential in making Panama hats, is not generally practised in the Republic.

Another straw commonly used by hat weavers is called guaguzinas, brownish in color, secured in greatest amounts from forests east of the Andes. This class of hats, although darker, is in

demand by the natives owing to the greater resistance of the fiber. The Province of Azuay is the center of the hat industry.

The cadi is the tagua or ivory-nut tree, often referred to by English-speaking people as vegetable ivory, and by Latin Americans as coroza nuts. This forest product has proved to be an excellent raw material for making buttons, novelties, chessmen, and other articles that previously were manufactured from bone, ivory, and similar hard substances. Tagua ranks fourth as to value of articles exported from Ecuador. It grows wild in the forests, and the cost of production involves only the work of gathering and transportation. Of the world's total output Ecuador's contribution is estimated to reach nearly four-fifths. There are unmeasured forest areas where the tagua has never been gathered. In the Province of Manabi, it is said, 60 per cent of Ecuador's ivory-nut exports originate. Other Provinces in which tagua is gathered, in the order of their importance, are Esmeraldas, Ríos, and Guayas. Up to this time no industries for manufacturing articles from tagua have been started in Ecuador. It has been rumored, however, that a license has been granted for establishing a modern button factory in Manabi.

EASTERN REGION AND ITS COMMERCIAL PRODUCTS.

The eastern region includes the Province of Oriente, of vast area, concerning which little is known except that some of its few inhabitants are uncivilized or semicivilized Indians. This region, always green, contains the greatest variety of trees. Of greatest commercial importance is the cacao tree. This tree is also common in parts of the tidewater region. Ecuador is one of the foremost producers, if not the world's largest producer, of this valuable commodity. The tree grows wild, found in abundant stands in forest regions, and therefore native to this country. There are several species of wild cacao, among which is one called pajarito that has a very small pod and tiny beans of doubtful commercial value. This tree is the cacao of greatest use for lumber. Considerable attention given to plantations of cultivated cacao in Brazil and other countries, as in parts of Ecuador, which have long passed the experimental stage, are said to have proved a profitable and substantial industry. Cacao cultivation is thought to have a promising future in Ecuador. The soil is judged to be specially suitable, and the area on which the trees can be grown is very extensive and easy of access. In appearance the wild cacao differs little from the cultivated tree. The advantage of the latter is seen in greater yield and in larger and higher-grade beans.

Among other plants of commercial importance in the forests of the eastern region, and a staple article of export, is the Guayaquil cane (*Guadua angustifolia*), found in numerous extensive patches. It reaches huge proportions, the height sometimes being 30 meters (nearly 100 feet). Guayaquil cane is not used nor shipped round but split into slats, or lath-like pieces, by natives using axes. It serves in place of lath for plaster partitions and for the exterior of houses, both plain and with cement stucco. In the rainless regions of Peru and Chile it is prized for roofing on warehouses and other storage buildings that need protection only from the sun.

The eastern part of Ecuador is also the native region of the vanilla, a climber (*Orchidaceæ*), of which there are two varieties: Select vanilla (*Vanilla aromatica*), with narrow leaves and large, thin beans or pods, and ordinary vanilla (*Vanilla palmifolia*), with the broader leaves and short, coarse beans. The latter species is the more common and constitutes the major portion of the Republic's total exports, which are relatively of little value.

The balata tree, giving the caoutchouc production, grows in forests in moist sections of Ecuador both east and west of the Andean cordilleras. Notwithstanding that there are said to be vast areas in this country where the rubber trees in plentiful stands remain untapped, rubber gathering in recent years has declined rather than gained in value and importance, owing to the competition of cultivated rubber in the Far East. But several experimental rubber plantations have been started in Ecuador, and the largest, comprising 400,000 trees, in the Province of Guayas, already gives promise of most favorable results.

ANDEAN REGION AND ITS COMMERCIAL PRODUCTS.

The Andean and intercordilleras region is not important from the standpoint of forest products. Trees common to the Tropics, such as have been previously mentioned, thrive in this region in the hot valleys between the mountain ranges; subtropical growths are indigenous to areas that are being given over to cereal cultivation on mountain sides and plateaus at altitudes of 2,000 to 3,000 feet; and unimportant stunted trees and shrubs appear at the higher altitudes.

Among the subtropical growths of this region are found the several species, chiefly *Ahumada pubescens*, from which chinchona bark, locally called cascarilla and more generally Peruvian bark, is procured. As in Peru, these trees reach their typical development and range over vast areas of country on both sides of the cordilleras. The exportation of this bark, widely esteemed for its medicinal properties, was formerly important, but it has recently been reduced to insignificance by competition from Java, India, and other parts of the Far East, where plantations were started with seeds from Ecuador.

The subtropical region also has frequent and well-developed stands of Australian eucalyptus in several species, which continues to be planted throughout this section of the Republic. Certain species are serviceable as lumber and represent an important source of wealth.

Another tree of the region is tocte, or Spanish walnut, which is claimed to produce an excellent lumber for furniture, similar in appearance to French walnut.

MINING AND AGRICULTURE.

Aside from fairly extensive developments in connection with gold mining in Oro Province, and similar undertakings for petroleum reported as starting in Esmeraldas and Loja Provinces, the rich mineral resources of Ecuador have received little attention. Deposits of silver, sulphur, iron, copper, petroleum, gypsum, quicksilver, lead, zinc, and mica, besides gold and emeralds, have been reported in

quantities warranting exploitation. Since the deposits are nearer the coast and water transportation than the mines of Bolivia or most mines in Peru, it is surprising that foreigners desiring new fields for mining operations have not before started what they have lately been reported as beginning—to make Ecuador a field for active prospecting work. If reports are true, mining in this Republic will yield products of greater value than the forests or agriculture.

The opening of the Panama Canal will doubtless cause Ecuador to give greater attention to fruit culture. Pineapples, oranges, pomegranates, lemons, alligator pears, and custard apples, which grow in the moist sections of the country's littoral, are among the varieties of fruit that might be brought to several important North American and European markets.

Agriculture and stock raising are pursuits growing in prominence. The Guayaquil & Quito Railway, under American administration, is pointing out to Ecuadorians and prospective immigrants the great possibilities in the Republic along these lines. Ecuadorian coffee ranks with the world's best grades, and the growing demand has caused coffee to become, next to cacao beans, the nation's chief article of export. Sugar, rice, tobacco, cereals, and potatoes, in desirable grades, are other products of the soil worthy of mention. Attention is being given to the possibility of utilizing the Andean slopes and table-lands for stock raising, for which they are especially suitable on account of their abundant wild grasses and their equable climate.

RESOURCES AND INDUSTRIES OF THE PROVINCES.

The following table shows the Provinces of Ecuador and their population, principal cities (with population), transportation facilities, and industries and resources. The information was obtained from a 1,300-page publication, entitled *El Ecuador, Guia Comercial e Industrial de la Republica*, issued at Guayaquil in 1909.

Provinces.	Population.	Capitals and population.	Transportation facilities.	Industries and resources.		
				Forest and agricultural products.	Minerals.	Manufacturing.
Armenia.....	200,000	Cuenca (35,000).....	.....	Corn, sugar, tropical fruits, toquilla, llamas.	Gold, silver, copper, lead, zinc, mercury.	Straw hats, brewery, distillery, flour mill, sawmill, planing mill, foundry.
Bolívar.....	63,000	Guaranda (8,000).....	.....	Coffee, cacao, lentils, wheat, barley, corn, cattle, timber.	Salt.....	Hides, distillery for aguardiente, timbering.
Cañar.....	80,000	Azogues (6,000).....	.....	Barley, wheat, corn, lentils, garavane, fruits.	Coal.....	Straw hats, timbering.
Carchi.....	46,000	Tulcan (15,000).....	.....	Sugar, cotton, coffee, cereals, potatoes, timber.	Salt, sulphur.....	Charcoal, straw hats, timbering.
Chimborazo.....	145,000	Riobamba (20,000).....	.....	Wheat, barley, lentils, corn, potatoes, coffee, sugar, rice, tagua, rubber, wool.	Gold, silver, copper, lead, iron, sulphur, mercury, marble.	Straw hats, soap factory, candle factory, textile mills.
Esmeraldas.....	25,000	Esmeraldas (3,000).....	Shipping port.....	Tagus, tobacco, cacao, rubber, mangrove bark.	Gold, platinum.....	3 sawmills, sugar refinery, distillery, straw hats, cigar factory.
Guayas.....	230,000	Guayaquil (80,000).....	Shipping, Guayaquil & Quito Ry.	Vegetables, fruits, rubber, cacao, sugar, tagua, corn, tobacco, timber.	Petroleum, sulphur, salt ..	Candle and soap factories, distillery, brick and tiles, sugar refinery, furniture, brewery, queensware, 9 sawmills, shipyard, match factory, planing mills, salt refinery, cotton gin, ice factory.
Imbabura.....	80,000	Ibarra (12,000).....	Railway from Quito to Ibarra under construction.	Sugar, cotton, coffee, beans, wheat, barley, corn, potatoes, cattle.	Salt.....	Brewery, tannery, saddlery, sugar mill, hides.
Leon.....	105,000	Latacunga (16,000).....	Guayaquil & Quito Ry	Vegetables, sugar, cattle, coffee, rubber, cereals.	Sulphur, copper, silver, lead, mica.	3 flour mills, sugar refinery, brewery, 9 sawmills, hides (cattle and kid).
Loja.....	80,000	Loja (3,000).....	.....	Wheat, lentils, corn, potatoes, barley, sugar, cotton, tobacco, cattle.	Gold, coal, iron, copper.....	Straw hats, distillery, sugar refinery, hides and skins.
Manabi.....	120,000	Puerto Viejo (8,000).....	Shipping to Manta.....	Cacao, rubber, coffee, tagua, sugar, cotton, rice, fruits.	Petroleum, salt, gypsum, copper, sulphur.	Brewery, ice factory, candle factory, sugar refinery, straw hats.
Oro.....	45,000	Machala (5,000).....	Rail connection with shipping port, Puerto Bolívar.	Cacao, coffee, rubber, tagua, rice, sugar, tobacco, cotton, mangrove bark, timber.	Gold, platinum, copper, zinc, salt.	Aguardiente distillery, logging, sugar mill.
Pichincha.....	200,000	Quito (80,000).....	Guayaquil & Quito Ry	Cereals, cattle, sugar, coffee..	Gold, silver, mercury, iron.	7 flour mills, sugar mill, straw hats, distillery, Aguardiente factory, sugar mill.
Rio.....	60,000	Babahoyo (4,000).....	.....	Cacao, sugar, rice, coffee, rubber, tobacco, corn	.....	Distillery, sugar mill.
Tunguragua.....	90,000	Ambato (10,000).....	.....	Wheat, lentils, barley, sugar	Shale, gold, silver.....	.....

PRINCIPAL PORTS.

Guayaquil and Quito are Ecuador's principal cities. The latter is the seat of the Government, the Episcopal Palace, and the National University. The city has no aspect of commercial importance, but has an impressive academic air. Guayaquil is the metropolis. So largely does the commercial, industrial, and political life center there that traveling salesmen often say "Guayaquil is Ecuador." Over the docks of this city more than 85 per cent of the Republic's imports are entered and distributed inland, while of the country's total exports 90 per cent, mostly carried out from the interior, are credited as cleared from this port.

So much does a traveler hear to the detriment of Guayaquil before arriving that it is not unnatural for him to enter the Republic for the first time with a decided prejudice. But in development, cleanly appearance, and other respects the city compares most favorably with cities of other west-coast South American countries, while conditions of living and facilities for transacting business are far better than reports would lead one to anticipate. In no particular more than the exaggerated reports of unhealthy conditions is Guayaquil handicapped in its commercial progress. However serious may have been the former conditions that were the origin of these reports, within recent years yellow fever and the bubonic plague have been decreasing, until in 1914, according to the information of a local medical authority, only three cases were reported in the entire country, and none in Guayaquil. An effective system of sanitation, projected by those who had charge of the sanitation of the Panama Canal Zone, is almost completed under contract with a responsible English firm. The stamping out of dreaded tropical diseases therefore bids fair to be as effective in Guayaquil as on the Isthmus. The commercial benefits have already begun to be felt in the expansion of foreign trade. Traveling salesmen now feel safe to call throughout the year, whereas formerly they made this port only during the dry season (June to October). An increase in the number of tourists visiting the country is also noted.

Except Guayaquil and Quito, there are few places of importance in the Republic. The trade of the ports of Manta and Esmeraldas is comparatively insignificant. The last-named city, next to Guayaquil, is the most important for the manufacture of lumber, and the surrounding territory produces some of the best varieties of hardwood.

Chapter II.—ECUADOR'S NATIVE WOODS AND LUMBER INDUSTRY.

NATIVE WOODS.

The principal woods in stock in the several markets and their botanical names, where they could be reliably ascertained, are as follows:

GUAYAQUIL.

Mangle (*Rhizophora mangle*).
Cedro (*Cedrela odorata*).
Roble (*Tecoma pentaphylla*).
Figueroa.
Laurel (*Nectandra laurel*).

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GUAYAQUIL—continued.

Palo cacao (*Theobroma cacao*).
Ceibo (*Bombax ceiba* and *Eriodendron*).
Fernan sanchez.
Guayacan (*Guajacum officinale*).

ESMERALDAS.

Amarillo.
Mahogany.
Cedro.
Guayacan.
Laurel.
Ebano (*Cæsalpinia* sp.).
Pechiche (*Vitea gigantea*).
Guachapelli.
Ceibo.

GUARANDA.

Arrayan (*Eugenia* sp.).
Sumi.

GUARANDA—continued.

Platuquero.
Chicarron (*Terminalia chicharronia*).
Guachapelli.
Laurel.
Cascarilla.

TULCAN.

Cedro.
Roble.
Matache.
Ceote.
Amarillo.
Ceibo.

MANGLE AND FIGUEROA.

Mangle, probably the most common tree in lowlands and along watercourses, furnishes material only for rough building construction. Ecuador is the only South American country that has found mangle fit for practical commercial uses. Colombia, Venezuela, and Brazil have the tree in plentiful stands, but except that its bark is exported for the sake of its tannic-acid content, the wood has been found suitable for no uses except fuel. In Guayaquil it is admitted to be an inferior rough structural material, but it is used because it is the only kind available in close and frequent stands near to watercourses and because, being softer than the majority of tropical woods, it is slightly less difficult to handle, work, and fit when not seasoned. Susceptible to twisting and serious checking, mangle is held in stock in log form, usually water-soaked. It goes to the saw only after the order is secured and is cut into rafters, scantling, beams, joists, braces, posts, crossties, etc.

As far as could be ascertained, figueroa has been given no botanical classification. It is not as hard nor as heavy as many tropical woods. Its color, a reddish-brown heartwood, is much in favor. Of noted durability, even in soil contact, and relatively easy to smooth, it answers largely for flooring, wainscoting, ceiling, panels, casing, and not infrequently for sash and doors. It may properly be termed the birch of Ecuador, taking the same important place as sweet birch in the United States. Owing to figueroa's remarkable strength, it is highly appreciated for gear parts of vehicles. Since the tree does not always grow straight, the logs are short, though usually of large diameter sizes.

CEDRO, LAUREL, AND ROBLE.

Cedro is the Spanish cedar of the same species as the cedar of Central America. It is not plentiful in Ecuador, but occurs in two varieties—cedro blanco, or white cedar, and cedro rosado, or red cedar. Because of the cost of logging the prices of native cedro in Ecuador are higher than the c. i. f. prices in Peru of the same wood cut in Guatemala. Spanish cedar is used for the same purposes in Ecuador as in nearly all other South American countries. It is the wood most prized and best adapted for sash and door material and answers largely for ceiling, panels, and other interior trim.

Laurel is one of the most expensive lumber woods on Ecuador's markets, because it is not plentiful. It is frequently used for high-grade furniture and cabinet work. For these commodities the brownish-colored heart of laurel, mottled not unlike Circassian walnut, presents a rich appearance in natural finish. The tree is also well known for its yield of a waxlike substance that answers for candle making. It is not so highly esteemed as beeswax, largely on account of its greenish color, but its cheapness, combined with serviceability, gives the commodity commercial standing.

Roble is a beech, though this common Spanish name means oak, but its economic importance in Ecuadorian markets is similar to that of white and red oak in the United States. It competes with cedro for better-grade sash, doors, and blinds, and with laurel and cedro for furniture; its most exacting use is for flooring.

OTHER WOODS.

Gigua and ceibo are in demand mostly for boxes and temporary uses in Ecuador, because they are plentiful and cheap. They are lighter than many tropical woods and very perishable. Ceibo is a common lumber tree, more widely exploited in Colombia and Venezuela than in Ecuador, but used for similar purposes. Ceibo logs are large, doubtless averaging in diameter as much as 36 inches. The tree, massive and handsome, is readily identified and widely appreciated by the public because the appearance of its yellow flower is regarded as marking the beginning of the rainy season. Gigua is not a tree, but a name applied to a mixture of several woods that are considered of little economic value except for temporary uses. Fernan sanchez and tulumbaco are local names for the principal kinds so classed. Cacao, somewhat better material, is also frequently included.

Guayacan, the well-known lignum-vitæ, is not expensive in Ecuador. Its resistance to decay in the open and in contact with the soil makes it especially valuable for foundation timbers of buildings, for crossties, and for other uses.

Coguito's strength, combined with considerable elasticity, makes it the leading material for light vehicle manufacture, or Ecuador's hickory. Guachapeli is used for boat-siding. It is durable in place without painting. Canoes, well shaped and easily manipulated, seen commonly in use by natives on all the Republic's rivers and streams, are largely the dugouts of trunks of two trees, guadapiro and masicarey. Palo de balsa is light as cork and the trees in development reach huge proportions. Of this wood the raft boats are made that are used by deep-sea fishermen far up and down the Pacific coast.

LUMBER MANUFACTURE, PRICES, AND USES.

Many of the various sawlogs brought to the Guayaquil market are square-hewed in the forests by natives before being assembled into rafts. The principal exceptions are mangle, ceibo, and fernan sanchez, which, without bark, are liable to so serious checking as to produce considerable loss. Round sawlogs are put through two sawing operations. First they go to an American-made portable mill, which usually has an inserted chisel-bit saw, where they are

slabbed on the four sides. The squared log is then removed to a vertical gang-frame sawmill (English make), identical with the mills widely used in Brazil, and is cut into lumber of various sizes by means of one operation for each log. As is customary in tropical countries, native woods in Ecuador are held in stock, in log form, and sawed only after lumber orders have been received.

Guayaquil has 8 active sawmills, Esmeraldas 3, and Cuenca, in the Province of Azuay, 1. These 12 mills constitute Ecuador's modern lumber industry; but in addition the production by manual labor, mostly by the use of the whip saw, doubtless represents a considerable quantity. Hand-sawn boards and planks have been used throughout the Republic for over a hundred years, and this material in small quantities even yet is found in stock at Guayaquil, because a few experienced wood users maintain that hand-sawn is preferable to machine-sawn lumber.

The prices of woods, first-hand, in logs, and retail, in lumber form, in 1,000-foot lots, are given in the following table. The vara (2.78 feet) is the common unit of measurement in Ecuador. The prices given in the table have been converted so as to conform to American measurement standards.

Kinds of wood.	Retail lumber prices.	Cost of logs.	Principal uses.
	Per 1,000 feet. \$45-\$60	Per 1,000 feet. \$20-\$25	
Cedro.....			Sash, doors, blinds, panels, partition, ceiling, finish, flooring.
Fernan sanchez.....	37- 40	15- 18	Boxed, ceiling, flooring, scaffolding, temporary and rough uses.
Roble.....	50- 75	20- 25	Furniture, finish, fixtures, doors and windows, flooring, novelties.
Figuerca.....	40- 50	20- 25	Flooring, finish, furniture, fixtures, doors, structural purposes, boats.
Laurel.....	60- 80	25- 30	Furniture, fixtures, finish, cabinetwork.
Cacao.....	35- 37	12- 15	Boxes, temporary and cheapest uses.
Mangle.....	40- 45	18- 22	Rough structural purposes, cheap flooring, sheeting.
Guayacon.....	40- 50	23- 28	Posts, pillars, crossties, maul heads.
Niguito.....		43	Vehicle parts, spokes, and felloes.
Pechiche.....	40- 45	25- 28	Tanks, vats, boat building, keels and keelsons, cornices.
Ceibo.....	35- 38	16- 24	Boxes, flasks, temporary rough uses, scaffolding.

WOOD-USING INDUSTRIES.

Wooden commodities in Ecuador are all handmade. They are products of small furniture or cabinet and carpenter shops, and the working of them reaches apparently a higher degree of perfection than would be anticipated from a class of untrained laborers. In fact, in cities of the coast as well as in those of the mountains furniture and other articles present a grade of workmanship and style that makes them compare favorably with similar articles imported. The same may be said of sash, doors, and blinds, and other house furnishings, which similarly are handmade in these shops. They are higher in price than the same commodities in other South American countries. They sell by the square foot and are made only to order. Doors 1 $\frac{1}{2}$ inches thick bring on an average the equivalent of 30 to 35 cents per square foot. Sash (unglazed) are about 5 cents per foot cheaper than doors, while blinds cost about the same as doors. A common door opening, for example, 4 by 9, equal to 36 square feet,



14. CEMENT-COVERED, STRAW-THATCHED ROOFS
CHARACTERISTIC OF NATIVE HOUSES IN SOUTHERN PERU.



15. A STREET IN CUZCO; MASONRY CONSTRUCTION AND TILE ROOFS.



16. A PILE OF LAUREL LOGS, SHOWING THE RANGE OF SIZES IN GUAYAQUIL.

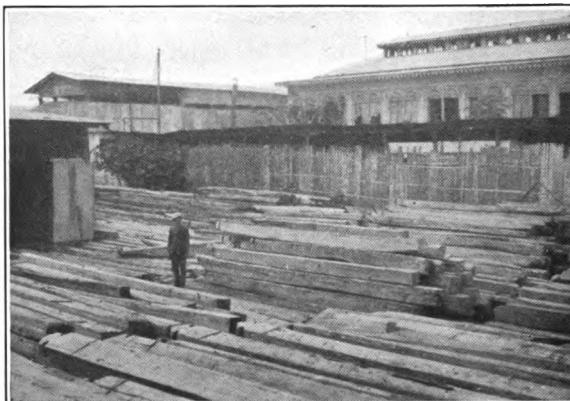
UNIV.
OF
MICH.



17. THE LARGEST-SIZE CEDRO LOGS SOLD IN ECUADOR.



18. TAKING ROBLE LOGS FROM RAFT TO SAWMILL AT GUAYAQUIL.



19. LOG STOCKS OF GUAYAQUIL SAWMILL. LOGS ARE NOT CUT UNTIL SOLD.

costs \$10 to \$12, according to the wood used. Cedro, which is easy to work, costs less than robe, figueroa, or laurel.

With less than 500 miles of railroad in the Republic, the demand for crosstie material in Ecuador is less than in any other country on South America's west coast. The ties in use are 7 inches thick, 7 to 8 inches wide, and 6 feet 8 inches long. Guayacan (*lignum-vitæ*) at 50 cents per tie and mangle at 30 cents each are the woods commonly employed.

DECLINE IN SHIPBUILDING AND LUMBER EXPORTS.

The fame of Guayaquil on the west coast for shipbuilding and as an export lumber market was traditional in the days prior to steamship navigation. Since then the business of the shipyards has been curtailed to repairs and to the local demand for a few small sailers for river and coastwise carriers. Shipbuilding in the former days was localized at Guayaquil, not because of the special adaptability of Ecuador's native woods (in fact, it is said that American pitch pine and white pine at that time played an important part in this industry), but because (1) this port was the only sheltered deep-water harbor on the west coast where it was practicable for work of this kind to be carried on, and (2) south of Guayaquil there are no available timber stands in countries of the Pacific coast until, 2,500 miles distant, the port of Puerto Montt is reached in far southern Chile.

Lumber exporting likewise has been reduced, mainly through the competition of softwoods from the United States, until, aside from small quantities of furniture woods going from Ecuador to Peru, and smaller amounts to ports of the west coast of Colombia, this trade is almost negligible. This condition does not mean, however, that Ecuador's woods are not worthy of investigation for export purposes. Many of these woods are well adapted to special uses for which certain properties are essential (such as exterior cabinetwork demanding decorative material combined with strength and a wood susceptible of high polish), and it is strongly advised that American lumber importers, because of the facilities offered by the Panama Canal for cheaper transportation, give these Ecuadorian hardwoods particular consideration.

Chapter III.—PROSPECTS FOR INTRODUCTION OF AMERICAN WOODS.

CAUSES OF PRESENT LACK OF IMPORTS.

The fact that Ecuador supplies the entire national lumber demand from its own forests might lead to the conclusion that those forests contain woods easy to cut and work, applicable for general uses, and occurring in sufficiently frequent and accessible stands to leave little opportunity for competition from the firs, pines, and spruces of North America. Observation, however, shows that this is not the case. Woods common in Ecuador's markets, although including species of rare coloring, attractive figure, and qualities unquestionably valuable for high-grade furniture and specialty purposes, are manifestly little suited for economical building and general uses. In fact, they are probably inferior to general-utility woods of the other South American countries in which investigations have been

made (Argentina, Uruguay, Brazil, Chile, and Peru). The natural laws of trade, therefore, are not accountable for the absence of foreign woods from Ecuador. Neither are national market conditions sufficiently different from those of the other South American Republics to curtail, much less to eliminate, the demand for coniferous woods. It is evident that several kinds of American softwood lumber would find a marketable opening in large quantities and could be readily disposed of. This impression is confirmed by the opinions of Guayaquil importers and lumber dealers, who for several years, in cooperation with wood users and some of the interested public, have been trying to change the statutes now in force barring lumber imports.

One of these statutes, interesting because doubtless the only law of its character known, sanctions the use of nonresinous, but prohibits the employment of resinous wood in city building operations. Its passage came about as the result of several conflagrations, especially the one that visited Guayaquil in 1896 and reduced to ashes a large portion of that city. The rapid spreading of the flames on that occasion was attributed to the presence of resin in southern yellow pine, which was at that time the common construction material in Ecuador, and of which about 10,000,000 feet was imported annually. There is no doubt that there are considerable variations in the inflammability of different woods, and perhaps long-leaf pine, which is called pitch pine in Ecuador, is among the most inflammable. But experience in other parts of the world has not shown that the difference is sufficiently great to make the use for building purposes of southern yellow pine or other resinous softwoods a menace.

The tariff law is another factor discouraging to lumber imports. In addition to providing a very high duty on lumber, the tariff law of Ecuador leaves discretionary power to customs officials in determining duty charges, so that a consignee can not definitely determine the tax that will be imposed. For instance, there has been a variation of as much as \$5 per 1,000 feet in the duty charges on different shipments of the same kind of hardwood from the United States. Approximately the duty amounts to \$18 to \$22 per 1,000 feet, which, with the cost of discharge, puts the landing or first-hand price of Douglas fir at about \$40 per 1,000 feet, southern yellow pine at \$48, and hardwoods, medium grade, at \$68.

It may be questioned whether it is to a country's best advantage to protect its lumber industry and encourage timber exploitation by very high duties, when local forests contain only limited stands of timber, which, moreover, is not of the highest value for economical construction and general-utility purposes. This is especially true in countries like Ecuador where transportation developments are limited and the cost of putting lumber on the market is high. When the woods available for building are all exceedingly hard, heavy, and dense, the cost of handling is high and builders may prefer to use substitutes, such as cement, iron, clay products, stone, etc., thereby defeating the primary purpose of the tariff law.

TERMITES AND RESISTANT PROPERTIES OF VARIOUS WOODS.

No other phase of the lumber situation in Ecuador is more important than the damage to wood caused by insect pests. The prob-

lem is more serious than in any other South American Republic, not excepting Colombia and Venezuela. Termites, or white ants, are thought to cause most of the damage. Only one who has been in Ecuador can have any idea of the extent of the damages from this source—wood's most formidable foe. It often happens that the presence of the ants is unknown until a joist or beam gives away or a flooring board collapses by the weight of one's tread, having been honeycombed until only a thin exterior layer remains untouched. Not infrequently buildings are torn down because pillars or other main structural pieces have been so weakened as to be dangerous. It is common in Guayaquil to see buildings being repaired because of damage by termites. The custom of building houses without concrete, brick, or stone foundations doubtless adds to the trouble from insect pests. Piers and corner posts of large dimensions, of some hard tropical wood, considered proof against termites, are planted in the ground. Ants often work, it is said, in subterranean passages, and therefore these planted structural pieces, even if very resistant, afford insects opportunities of easy access to parts of buildings more inviting to their activities. White ants do not confine themselves to woods. Injury to books, paper files, fabrics, clothing, shoes, wall paper, foods, furniture, and many other articles is attributed to their acitivities.

Southern yellow pine, all heart grade, used to be brought around Cape Horn to Ecuador in preference to importing the much cheaper Douglas fir from the North American west coast, because experience in this Republic, as in near-by countries, shows pitch pine to be considerably more resistant to ants, though apparently not termite proof. Hard tropical woods find ready uses mainly because proof against ant attacks, even though otherwise they are unsuitable and uneconomical. Authentic information, therefore, giving practical treatment of coniferous woods to make them resistant even for limited periods would interest Ecuadorians and would give impetus to the movement for the abolition of the statutory restraints on importation.

CONCLUSIONS.

Any immediate extension of the lumber trade in Ecuador would involve only small quantities, but should the present barriers to soft-wood imports be removed or adjusted by legislation, as seems likely, an opening for a not inconsiderable supply of American conifers will be afforded. It would be well for American lumbermen to bear this situation in mind and through American consular and diplomatic representatives in Ecuador, furnish to local importers information concerning the valuable properties and economical utilization of fir, spruce, pine, and cypress.

The Panama Canal has brought Ecuador many hundred miles nearer to the world's markets, and the Republic has the advantage of being nearer to the canal than the other west-coast countries. The coast line of Ecuador includes several of the best natural harbors of the west coast of the southern continent, and effective efforts are being made to render the coast cities sanitary. With transportation facilities thus offered, Ecuador's rich and largely undeveloped natural resources present unequaled opportunities for exploitation.

COLOMBIA.

INTRODUCTION.

A small lumber demand and a high tariff are the conditions that combine to limit the annual imports of American woods into Colombia to a few schooner loads each year. The situation, therefore, viewed for to-day's markets or under conditions similar to those of the past, would warrant only casual investigation; but rapid economic development is almost assured for this Republic as the country probably most benefited by the opening of the Panama Canal. The vast Pacific-coast region of the Republic, heretofore the most remote coast region in the southern continent, will now be brought into close proximity to the world's markets. Communication between this western region and Colombia's Caribbean coast will be established for the first time, and closer attention of capitalists and of the commercial world to the existing business opportunities in Colombia is bound to result in national growth and industrial expansion.

Chapter I.—ECONOMIC CONDITIONS AND THE NATIVE LUMBER INDUSTRY.

Considering the wonderful natural resources of Colombia, the proximity of its north coast to the world's markets, and the ocean-transport facilities (about equal to those of any country in South America except Argentina and Uruguay), consisting of direct steamship lines to the United States, Italy, France, Spain, England, and Germany, the Republic's limited commercial development is somewhat surprising. The greatest of Colombia's resources at present developed is the emerald deposits, which yield most of the world's supply. The mineral resources include in exploitable quantities nearly every metal, but mining operations on an important commercial scale are thus far confined to the production of gold; that of platinum and silver is very small. Cereals, vegetables, and fruits are grown for local consumption but only coffee of high quality and bananas are of sufficient importance to export. The outlook is promising for various products of the soil as yet untried. At present bananas are the Republic's chief article of export and their culture is one of the nation's most profitable industries, extended in recent years through irrigation. The Republic's forest resources are practically unexploited, except for several fair-sized concerns supplying the domestic demand and a couple of smaller ones interested in producing a limited quantity of export material.

UNPROMISING OUTLOOK IN LUMBER INDUSTRY.

The Atrato and Sinu River districts are not the only regions in Colombia containing extensive timber stands. There still remain in the Cauca Valley extensive forests, and the woodlands stand prac-

tically untouched along various affluents of the Magdalena River in the eastern section of Colombia. According to lumbermen, naturalists, and engineers who have knowledge of interior conditions, the forest areas in Colombia are far from being as extensive as is generally believed and still further from being as valuable.

The scattered stands that are typical of Colombia mahogany and Spanish cedar are illustrated by the following experiences of lumbermen. One American concern, in connection with three years of active lumbering in Colombia, made a careful investigation of 6 square miles of timberland. The estimate, made with a view to purchase, showed only 1,700 trees of merchantable type. Another American syndicate, said to be well capitalized, expended over \$11,000 in reconnaissance of a large timber tract in the Magdalena Valley for commercial exploitation, and reported that the undertaking on any scale would be hazardous.

The history of the lumber and timber industry in Colombia shows retrogression instead of growth. The efforts of American and other experienced foreign lumbermen, involving physical hardships and the expenditure of large amounts of capital, considerable time, and serious study of the timber business, especially the extraction of export woods, have nearly all resulted in failure. The kinds generally exported (mahogany and Spanish cedar) stand so widely scattered that the expense of getting the logs out to the banks and then down the rivers to the seaports was too great to make possible profitable marketing at prices current in Europe and the United States. The handling of kinds salable in Colombia offered conditions, if anything, less promising. The demands of accessible markets were too small, delivery costs too high, and methods of trading too undesirable to warrant any but very limited operations.

Among concerns active in lumber operations are three manufacturers in the coast region, all interested primarily in domestic marketing. One, as a side line, gets out logs for foreign shipment and has the advantage of controlling transportation by owning seagoing boats. Two of these three mills operate only to a limited extent in outlying districts, one along the course of the Atrato River, and the other in the valley of the Sinu River. The third is a suburban mill running three circular saws, located in Barranquilla. Also worthy of mention as indirectly a part of the industry, is an exporting firm, a branch of an American lumber importer of Boston and New York, which is active in the western part of the Republic in the purchase of small numbers of mahogany and cedar logs. The markets of the interior sections of the Republic depend mostly on hand-sawn material.

MARKETS AND WOOD-CONSUMING REGIONS.

The five chief markets of Colombia are Bogota, Medellin, Barranquilla, Cartagena, and Santa Marta. Santa Marta does not compare in population with a half dozen other Colombian towns; but being an excellent port, from which the largest export trade originates, and a distributing center for one of the best developed agricultural sections, it is commercially more important. From the standpoint of wood consumption there are three regions in Colombia, as distinct as if parts of different countries: The coast, or Caribbean, region (including the cities of Barranquilla, Cartagena, and Santa Marta) and

the Bogota and Medellin regions. The population of the principal markets is as follows: Bogota, 120,000; Medellin, 70,000; Barranquilla, 50,000; Cartagena, 38,000; Santa Marta, 15,000.

INADEQUATE MEANS OF COMMUNICATION.

Lack of internal transportation facilities is the primary reason for Colombia's slow development. Except a couple of short railroads facilitating local commerce in various interior regions and the banana-plantation line out of Santa Marta, there are only a few lines of limited mileage, supplementary to river transportation. The Magdalena River, flowing through the Republic almost directly northward over 900 miles and emptying into the Caribbean Sea, is the principal artery of trade in Colombia. It offers the only means of reaching the developed portions of the interior from Cartagena, Puerto Colombia, or Barranquilla. Though this navigable river was valuable for interior development in early days, it has become an actual obstacle to the country's development in recent years, when throughout the world the time of travel is being shortened and international commerce is of growing importance to all nations. Because after a fashion the Magdalena answers the purpose, other needs of the country are put ahead of modern transportation facilities.

The Magdalena's swift current requires almost three times longer to ascend than to descend. The boats (all wood burners), propelled by stern paddle wheels and having no more than 3½ to 4 feet draft, are of limited capacity. Over certain parts of the river's course navigation is difficult and delays are frequent. The river does not afford through traffic. To pass around the rapids above La Dorado one of the supplementary railroads (the La Dorado-Beltran Line) is used. At Beltran the small "upper-river" boats attend to traffic to Giradot, and from here to Bogota there are all-rail connections owned by two corporations, which operate lines of different gauge. It takes passengers 11 to 14 days, according to varying depths of the river, to make a trip from Barranquilla to Bogota and 7 to 9 days to go to Medellin. Freight requires almost twice as much time, and from ocean steamer to Bogota, the chief city, goods must undergo six transshipments. The cost of shipping 1,000 feet of lumber from Puerto Colombia to Bogota would be about \$58. To Medellin no rate on lumber could be secured, but it is fair to assume that it would be nearly as high as that to Bogota, because part of the route from Puerto Berrio, the port of Medellin on the lower river, to destination would have to be covered by pack transportation. A passenger in normal times can go from Barranquilla to New York within less time than from Barranquilla to Bogota and at about the same cost. It is not unusual to meet leading business men in Cartagena and Barranquilla who have never undertaken the trip to the capital of the Republic.

Chapter II.—CONSUMPTION AND IMPORTS OF LUMBER.

No official records are kept of lumber production in Colombia, and Government import figures for recent years are not available. The basis of the statistics that follow, selected to show the extent of production and importation, was the average of estimates of local

lumbermen in the five markets referred to. The estimates cover an annual average of trade in three to five years of normal business.

	Barran-quilla.	Cartagena.	Santa Marta.	Medellin.	Bogota.	Total.
Southern yellow pine.....	Feet. 1,000,000	Feet. 600,000	Feet. 60,000	Feet.	Feet.	Feet. 1,660,000
American white pine.....	120,000	40,000	20,000	-----	-----	180,000
Other American woods.....	100,000	35,000	20,000	-----	-----	155,000
Native hardwoods.....	2,500,000	1,800,000	300,000	3,400,000	2,960,000	10,960,000
Total.....	3,720,000	2,475,000	400,000	3,400,000	2,960,000	12,955,000

TRADE IN AMERICAN WOODS VIA PORTO RICO.

That Colombia receives a much greater quantity of American lumber than is recorded as leaving Continental United States is an interesting feature of lumber markets in this Republic. Southern yellow pine is the predominant imported wood, the most favored of any lumber consumed, and the only wood imported in cargoes. Instead of being contracted for and shipped direct from the United States, the major portion is purchased in Porto Rico, from stocks brought there from the Gulf ports. The firm most interested in lumber imports also claim to be the largest lumber-export operators. They can make economical deliveries because they own their own fleet and they take advantage of trade arrangements with Porto Rico providing for the exchange of Colombian mahogany and Spanish cedar for southern yellow pine. The situation is the more interesting because, it is said, a considerable portion of the Colombian woods sent to Porto Rico are subsequently marketed in the United States.

Colombian and Porto Rican dealers have been carrying on this lumber exchange for a number of years. Lately conditions produced by the European war have affected business conditions in both countries to such an extent that it has been necessary to discontinue the business, and negotiations are now under way for similar dealings direct with United States. If this movement is successful it should benefit the lumber industry in both countries. Colombia has room for several times the present consumption of American softwoods, and American cigar-box and furniture makers can doubtless arrange to obtain a larger portion of their Spanish cedar and mahogany from Colombia. Further, Colombia has other forest products of value for export, such as mangrove bark and divi-divi, rich in tannin content; mora, fustic (the common dyewood), and lignum-vitæ.

LUMBER CONSUMPTION IN THE COAST REGION.

High transportation costs are the barrier against sending lumber from the coast region to important interior cities. The only way to change the situation would be to extend to Bogota the present Barranquilla-Calamar Railroad. The extension, it is said, can be constructed the entire way with no grade heavier than 2 per cent. So far as could be learned, the only imported forest products that have found their way to Bogota or Medellin were a few shipments, at long intervals, of American veneer and of mahogany and oak for

furniture, and several parcel lots of white-oak tight-barrel staves. The import lumber trade of Colombia is confined, therefore, to the three Caribbean coast cities (Cartagena, Barranquilla, and Santa Marta). The quantities brought into Cartagena and Barranquilla are for consumption by these cities, as the outlying rural parts use a very small quantity of lumber. In Santa Marta the situation is somewhat different. The city is small, but by the aid of an excellent port and an inland railroad this town has become the distributing center for banana plantations, farming sections, and several near-by communities.

In Barranquilla the industry at present consists of two firms conducting fairly large operations upon different bases. One uses the common American method of manufacturing lumber, rough and planed, at a mill in close proximity to the forest, and shipping the finished stock by boat to Barranquilla to be distributed from a well-regulated retail lumber yard. The other firm uses the method customary in South America of bringing the logs to Barranquilla to saw, plane, etc., for direct delivery to the consumer. Both concerns carry stocks of lumber from the United States, one importing in privately owned ships. Among important large consumers of lumber in this market are, first, the operators of 18 miles of railroad from Puerto Colombia to Barranquilla, who are likewise the owners of the valuable dock facilities at Puerto Colombia; and, secondly, Magdalena River navigation companies who maintain boat building and repair yards. The United States supplies most of the lumber used by these concerns, which both import direct and purchase through local lumber dealers.

Cartagena has two lumber dealers, both conducting retail yards. One carries on saw and planing mill operations near the forest and deals only in native lumber woods. The other deals only in United States lumber, importing both rough and planed material. This leaves Cartagena without any industry operating woodworking machinery. Nearly all planing in connection with the making of sash and doors, casings, etc., is handwork. As in Barranquilla, the largest consumers are the railroad (the line from Cartagena to Calomar on the Magdalena) and the local shipbuilding yard. Concerned with forest utilization in Cartagena is an industry of considerable extent producing tannin extract from mangrove bark. A large portion of this product is marketed in the United States.

Santa Marta has only one lumber yard. Barranquilla sends the native lumber stocks, and the foreign wood comes in small-parcel shipments from the United States. The United Fruit Co., the owners and operators of the extensive banana plantations, and the Santa Marta Railway, which operates nearly 90 miles of track, having need to consume considerable lumber, usually receive their supplies direct from North America.

KINDS OF WOOD FOUND IN THE COAST MARKETS.

FOREIGN WOODS.

In all three markets of the coast region, southern yellow pine is the principal wood imported, and white pine from Canada and the Lake States is next. Southern yellow pine is the only lumber received in cargo quantities, but it is also brought in parcels, like white pine.

White oak and white ash have found their way to Colombia, but only for special purposes of private users. Bald cypress, commonly termed in the United States "the wood eternal," is being received in Santa Marta. In no market in South America previously studied has this wood from the United States been found among the imports. Cypress has won here through its durability, decided resistance to termites, and ease in working, a most favorable combination of properties in softwood for the Tropics. This will doubtless lead to its early introduction in other markets of Colombia, particularly in Barranquilla and Cartagena. Douglas fir, at Puerto Colombia, in the form of creosoted piling and treated timbers of large dimensions for dock improvements, was the only evidence noted of any wood from the west coast of the United States having been introduced into either of the countries along the Spanish Main.

NATIVE WOODS.

The slight difference in the kinds of native woods constituting standard stocks in Cartagena and in Barranquilla is due to the fact that the sources of supply are widely separated regions. The domestic woods on sale in Santa Marta are practically the same as the kinds common in Barranquilla.

Colombian mahogany.—Colombian mahogany (*Cariniana pyriformis*), locally called caoba, is the most expensive native wood, bringing about \$60 per 1,000 feet in board form. For nearly 40 years the Republic has been exporting Colombian mahogany in small quantities and selling the wood in the United States and France as mahogany; but this common term is a misnomer, as it belongs to an entirely different family from the true mahogany, which is technically known as *Swietenia mahagoni*. Botanically, the two trees are said to be widely unlike. The resemblance is in the appearance of the woods, which are closely similar in grain and color. True mahogany is said to grow in Colombia, and in no other South American country; it is not, however, in stands of commercial importance. Colombian mahogany constitutes the principal export material from the Republic's forests. The wood does not grade as high nor bring as high a price in the world's big markets as does true mahogany taken from Central America, Mexico, and the West Indies. Colombian mahogany, however, is capable of serving every purpose of true mahogany, and has gained the reputation of being one of the best substitutes. In Colombia this wood goes for furniture, store fixtures, and interior trim of the best class of houses.

Spanish cedar.—Spanish cedar belongs to the same family as the true mahogany (*Meliaceæ*), which is unrelated to the family of the Colombian mahogany (*Lecythidaceæ*). Cedro, as the tree is called in Colombia, grows in moist sections, and one or the other of several species (the woods of which closely resemble one another in appearance and adaptability) is found growing in every country of South America except Chile. Furthermore, cedro lumber is foremost of all native woods in every South American Republic. The tree reaches huge proportions in Colombia, and it is not unusual to see on the market logs of very large dimensions. The scattered occurrence of Spanish cedar makes its exploitation difficult and largely

accounts for its relatively high price in Colombia, where it costs more than the imported southern yellow pine and only a little less than upper grades of American white pine. Spanish cedar's active demand for export in Colombia also contributes considerably to its high price. The lumber answers for sash, doors, flooring, ceiling, partition, and furniture.

Mazabalo.—Mazabalo is heavier, harder, and stronger than Spanish cedar, which in color and structure it closely resembles. Mazabalo is perishable in the open. Opinion is divided as to its resistance to white ants, but the impression in this particular is favorable, and it is therefore called on more than any other native wood for rough structural parts of buildings. The logs are subject to serious heart defects, and a large percentage of low-grade boards therefore accumulates, which slowly find demand for temporary uses, such as concrete forms, boxes, crating, etc. In Barranquilla mazabalo is also called abarco, while in Cartagena a wood named guino, much like it in appearance, is called on for identical uses. Mazabalo is the principal competitor of southern yellow pine for structural building parts. It makes its way in trade because of its low price, but it is manifestly inferior to pitch pine.

Ceibo, canalete, and carreto.—The trade gives the name ceibo to two varieties, which are termed ceibo blanco and ceibo colorado. Ceibo blanco, most abundant, is a very porous wood, of minimum strength and light weight, and is perishable. It has the reputation of being the most susceptible to fungous deterioration of any native wood. Ceibo colorado is preferred for commercial uses; it is so superior as a lumber wood to the white ceibo that there is probably no botanical relation between them. Red ceibo (the color being light reddish) answers for the siding of small boats and skiffs, for cheap flooring, and for low-priced doors and blinds.

Canalete is an excellent furniture and flooring wood, but, being hard, it is rather difficult to work. It is employed in the rough for joists. The price is \$45 per 1,000 feet in the form of boards and planks. This wood appears in Venezuelan markets also.

Carreto is another wood found in the markets of Venezuela and Colombia. It is greatly appreciated for high-grade hardwood flooring, and, on account of its strength and durability, meets satisfactorily several special uses in heavy vehicle building.

Roble, guayacan, and canimi.—Roble is the Spanish word for oak, but the South American roble is not an oak. In Colombia three different woods bear this name. The most common is the only wood appearing in all the principal lumber markets, both of the interior and of the Caribbean region. Cheap furniture, ordinary grades of doors and blinds, flooring and trim, and structural dimensions are its principal uses.

Guayacan (*lignum-vitæ*) is well known as the most durable of tropical woods when exposed to the elements. It is very hard, heavy, and extremely close-grained, with deep-brown heart and cream-colored sapwood. In Colombia it is sought after for local uses in the markets of the coast region. For exportation its demand is irregular. The tree commonly does not grow large, and it is frequently crooked. Logs of regular lumber sizes are scarce and high-priced. It is employed chiefly for crosstie material, but also for furniture and

mechanical parts, pole rafters for Spanish tile roofing, and small vehicle dimensions.

Canimi appears only on the Cartagena market. It is of the heavy, dense, tough tropical species, which shows great durability when used outside. The wood answers for high-grade hardwood flooring and cabinetwork.

IMPORT METHODS.

The middleman, who appears conspicuously in international lumber transactions in other South American countries, takes no part in lumber imports in Colombia. The lumber dealers and the large users attend to the details and unloading of their own imports. The largest lumber dealer and importer, previously referred to, until recently was trading Colombia mahogany and Spanish cedar for American southern yellow pine in Porto Rico. Other principal buyers of parcel consignments secure their wants through New York exporting houses. No information of direct dealing of American mills with Colombian dealers could be ascertained.

Of the southern yellow pine coming to Colombia in parcel shipments, a much larger part than would be expected is billed as clearing from New York, notwithstanding the regular and frequent steamship sailings from New Orleans. Cypress comes to Santa Marta from New Orleans. White-pine parcels are shipped from New York. All the cargo shipments that come to Colombia are carried in sailing vessels. The ships clear with yellow pine from Porto Rico and Gulf ports of the United States, carrying 600,000 to 800,000 feet.

The cargo freight in times of normal business amounts to \$11.50 to \$13 per 1,000 feet. The high rate is due to the few opportunities that exist for return cargoes. Freights on parcels from New York to Cartagena, Puerto Colombia, and Santa Marta are \$10 per 1,000 feet on lumber up to 20-foot lengths, \$12 on lumber of 20 to 30 foot lengths, and a special rate for lumber over 30 feet long. Rates for creosoted material of the same classification are twice those named for untreated material.

GRADES AND DIMENSIONS.

It is not unreasonable for Colombian dealers to specify and demand that southern yellow pine should be all heartwood. Experience shows that the resinous heartwood withstands the attacks of insects better than the sapwood, and it is stated to be rather exceptional for more than a small percentage to become infested. Not all pitch pine in stock, however, is heart grade. Prime and merchantable, according to the Gulf-coast classification, are also on hand. The merchantable answers chiefly for door and blind manufacture and is imported in relatively small quantities. The grade of white pine sent to Colombia, judging from the small stock on hand, is a mixture of American domestic grades, according to Tonawanda rules, doubtless "No. 1 barn" up to "No. 1 dressing." The largest amounts of both white and southern yellow pine are imported rough. Worked material, flooring, ceiling, and partition in several patterns and grades are the forms of the imported dressed southern pine, largely

short-leaf pine, while the dressed stock of white pine is partition in plain and beaded designs.

American dimension standards are acceptable in Colombia as applied to the lumber imported and often to native lumber manufactured. Incoming cargoes vary in their schedule of sizes according to the stock on hand. The range is from 12 by 12's down to 1 by 4's in many regular dimensions of timbers, deals, and boards.

White pine arrives in board form, largely 4/4, and in widths at present not less than 8 inches; formerly not less than 10 inches was the rule, and 12-inch material constituted the major portion. The 8/4 and 10/4 white pine is shipped in very small amounts for foundry patterns. In this use it competes with Spanish cedar and the demand is therefore exceedingly small.

DUTIES.

The tariff imposed by the Colombian Government on lumber and lumber imports is as follows: Rough lumber, \$0.01 per kilo (\$18 per 1,000 feet); worked lumber, \$0.02 per kilo (\$32.50 per 1,000 feet); doors and windows, \$0.05 per kilo (\$0.0225 per pound); cross-ties, \$0.01 per kilo (\$0.0045 per pound); box shooks, \$0.01 per kilo (\$0.0045 per pound). These imposts are increased 2 per cent to cover a surtax, and there is, in addition, a landing charge of about \$2 per ton. According to local lumbermen, the duty and the cost of discharge of southern yellow pine amount to approximately \$25 per 1,000 feet in Barranquilla and \$23.80 in Cartagena.

With the handicap of so high a tariff it is little wonder that American lumber finds Colombia a difficult market. In fact, the quantity imported under these conditions is surprising and tends to show the inferiority of the common native woods for general uses. A lower tariff would mean cheaper softwood lumber in Colombia, which would present an opportunity for establishing a large planing-mill business in Barranquilla and Cartagena and would lead to a movement for better home buildings.

USES AND PRICES OF IMPORTED AND NATIVE WOODS.

The principal use of white pine is for exterior paneling on the superstructure of river boats. It is also for this use that worked white pine (partition) is imported.

Southern yellow pine meets the largest part of the flooring demand—doubtless 65 per cent or more of the total wood flooring consumed in the coast region. Ceiling, partition, and finish are other important uses, for which, however, native woods are called on in greater amounts. Pitch pine (southern yellow pine) is employed for less than 10 per cent of the regional demand for house framing or structural parts. Its high price militates against its holding anything but a subordinate position to native woods in the quantity used. Southern yellow pine is most prominent among woods employed in construction and repair work of railroad cars and of sailing and river boats, while vehicle makers use it extensively for constructing the beds of two-wheeled carts. Sash and doors are made of this wood occasionally, and also furniture, principally store fixtures and bedroom pieces. Considerable southern yellow pine comes

to Colombia in the form of crossties. Bald cypress made its first appearance in the Republic in the form of crossties for the Santa Marta Railway. Since then the demand for cypress sleepers has been steadily increasing. Cypress lumber was afterwards imported for signals and various other outdoor requirements in connection with railroad maintenance of way.

The following table shows the common and scientific names and the normal retail prices and uses of imported and native woods common on the markets of the coast region of Colombia:

Kinds of wood.	Botanical names.	Market prices.	Principal uses.
Mazabalo.....	(a).....	Per 1,000 ft. \$30-845	Building parts (structural), boxes, flooring, partition, etc.
Cedro.....	Cedrela odorata.....	50- 55	Shash, doors, and blinds, house finish, ceiling, flooring, furniture, patterns, boxes.
Caoba.....	Cariniana pyriformis.....	60- 70	Furniture, rough structural uses, fixtures, house finish, doors.
Canalete.....	Aspidosperma excelsa.....	45- 55	Rough structural uses, oars, vehicle parts.
Carreto.....	(a).....	45- 55	Flooring, rough structural uses, vehicle parts.
Guayacan.....	Guajacum arboreum.....	50- 60	Furniture, novelties, mechanical parts, crossties, hammers.
Canimi.....	(a).....	40- 55	Flooring, rough structural uses, vehicles.
Balsamo.....	Myrsopermum erythroxylum.....	45- 50	Boat parts, rough structural uses, dock timbers, railway cars.
Roble.....	Tecoma pentaphylla.....	40- 55	Furniture, fixtures, flooring, etc.
Guimo.....	(a).....	30- 40	Rough structural uses, flooring, ceiling, boxes, flasks.
Ceibe.....	Bombax and eriobedron.....	20- 45	Boxes, crating, temporary uses.
Southern yellow pine.....	Pinus palustris.....	60- 70	Flooring, ceiling, partition, rough structural uses, railway cars, boats.
White pine.....	Pinus strobus.....	75-100	Partition, boat panels, patterns.

• Not classified.

MEDELLIN REGION.

Medellin, though distant from the coast and difficult of access, is the second city in Colombia in size and, probably, in commercial importance. Situated at an elevation of 5,000 feet, it enjoys a temperate climate. It is a relatively well-developed center, with good water and electric light, while its inhabitants represent as high a type of intelligent citizenship as is found anywhere in South America. The rich mining section in and near the Department of Antioquia, of which Medellin is the capital, has developed Medellin as an important trade center, where considerable wealth is accumulated and extensive business transacted.

The timber supply for Medellin and vicinity is met entirely by the native forests. The fine woods, called canimi, cedro (Spanish cedar), caoba (mahogany), canella, pinon, and cariano, are brought long distances from the valleys of the Cauca and Magdalena Rivers. There is another class that might be called ordinary woods (encenillo, roble, and laurel), which come from the Magdalena or regions nearby. The third class is cheap woods originating close to Medellin and largely including lumber from planted trees not indigenous, such as willow, some foreign species of pine, and drago. The last named is the dragon tree, famed for its production of reddish resin—an

exudation called dragon's blood—used for coloring wood stains and varnishes. The tree is of commercial value in Colombia only for its lumber.

The following table gives the normal wholesale and retail prices and uses, by classes, of the woods common in the Medellin market:

Kinds of wood.	Wholesale price.	Retail price.	Uses.
Canimi.....	Per 1,000 feet. \$50	Per 1,000 feet.....	Structural uses, crossties, and exterior work.
Cedro.....			
Caoba.....			
Canella.....	50-60	570-880	Flooring, furniture, fixtures, trim, sash, doors, and blinds.
Pinon.....			
Carlano.....			
Encenillo.....			
Reble.....	30-40	45-60	Structural uses, cheap furniture, fixtures, flooring, exterior finish.
Laurel.....			
Sence (willow).....			
Pine.....	14-20	20- 35	Boxes, crating, and temporary uses.
Drago (dragon tree).....			

Logs are squared and cut in the woods by ax and crosscut saws to dimensions about 6 $\frac{1}{2}$ by 10 inches by 11 feet. They are "snaked" out of the forest, and because of the dragging, the pieces throughout Colombia are called "rastras." Rastras are cut to the size mentioned because two, one on each side of the back of a burro mule, constitute the proper load for pack transportation. All lumber used in Medellin is carried in this manner. Some of the kinds that come from the Magdalena and Cauca Valleys require trips of five to seven days' duration. If the road is considered good, the price, about the standard rate of lumber hauling, is 50 cents per pack for each section of 15 miles, equivalent to about 28 cents per 1,000 feet for each mile. A rastro, if cut into boards, produces 6 pieces 1 inch (scant) by 10 inches by 4 varas (about 11 feet); if cut into planks approximately 2 inches and 3 inches in thickness, it produces 3 of the former size and 2 of the latter, likewise 10 inches wide and 11 feet long.

Another dimension not common but standard, answering principally for joists, is 3 by 5 inches by 6 varas (about 16 $\frac{1}{2}$ feet). In pack transportation two of these logs are handled in the same manner as rastras.

All resawing in Medellin and vicinity has been done by hand with whip or crosscut saws. Recently a circular sawmill and steam engine has been imported from the United States, which is the first machinery of the kind introduced into the Department of Antioquia.

The lumber production of the Medellin region, by classes, is as follows: Canimi, canella, caoba, etc., 1,300,000 feet; roble, laurel, etc., 1,400,000 feet; willow, pine, drago, 700,000 feet; total, 3,400,000 feet.

BOGOTA REGION.

Bogota is the largest city of the Republic, the metropolis of the interior, and the capital. The elevation is over 9,000 feet and the climate is cool and salubrious. Besides being the seat of government, the city has long been famous as a center of culture and learning; many noted educational institutions, besides the Government

museum and library, are located there. Bogota has numerous small manufactories, paved streets, electric lights, and electric street cars. Several short lines of railroads and many good pack roads enter Bogota, which is therefore the trade center for a large area of surrounding country extending even into western Venezuela.

The methods of production and consumption of lumber in Bogota are similar to those in Medellin, except that squared timbers, the form in which wood arrives at the market, show a greater variety of lengths than in Medellin, other dimensions being the same. Woods are brought in by rail and pack. The surrounding country is the source of supply except for the most valuable kinds, which are carried over long distances from the east as far as the headwaters of the Orinoco and from the west as far as the Magdalena Valley.

Of special interest in connection with wood utilization in this region is the so-called Bogota white pine, a conifer doubtless of the same botanical order as the American conifers and of similar adaptability, meeting uses in Colombia similar to those of white pine in the United States. It belongs to the trees of the Andean region and probably occurs in very high altitudes. This lumber can not compete with white pine in the markets of Colombia's coast region, owing to the high cost of river transportation to the Caribbean shore.

One of the commonest trees seen as a shade tree in Bogota and on farms in the neighborhood, reaching large proportions but seldom employed commercially as lumber, is the eucalyptus (*Eucalyptus globulus*), the species that has been widely planted in California. Its greatest local commercial importance lies in its use as fuel.

The quantity of lumber, roughly estimated, annually going into commerce in Bogota, including all kinds, has been put at 3,000,000 feet board measure. The kinds of lumber standard on the market, their scientific names, their pre-war prices, and their chief uses, are shown in the following table:

Kinds of wood.	Botanical names.	Retail prices.	Common uses.
Pino.....	<i>Podocarpus taxifolia</i>	Per 1,000 ft. \$60-\$80	
Nogal.....	<i>Juglans bogotensis</i>	90-100	
Cedro.....	<i>Cedrela odorata</i>	90-100	
Cedro de bogota.....	<i>Cedrela bogotensis</i>	65-70	
Pata de gallo.....	<i>Psidium dubium</i>	65	
Guavabo.....	<i>Quercus granatensis</i> or <i>Tecoma pentaphylla</i>	60-70	
Roble.....			
Cedro de bogota.....	<i>Cedrela bogotensis</i>	65-75	
Pino.....	<i>Podocarpus taxifolia</i>	70-80	Ceiling and partition.
Pata de gallo.....	(a).....	50-60	
Cedro.....	<i>Cedrela odorata</i>	90	
Cedro de bogota.....	<i>Cedrela bogotensis</i>	70	
Pino.....	<i>Podocarpus taxifolia</i>	80	Doors and windows.
Nogal.....	<i>Juglans bogotensis</i>	100	
Amarillo.....	<i>Oreodaphne</i> sp.		
Chinguaca.....	<i>Viburnum tinoides</i>		
Roble.....	<i>Quercus humboldtianos</i> or <i>Tecoma pentaphylla</i>		
Susca.....	(a).....	35-50	Building and structural parts.
Ensenillo.....	<i>Weinmannia</i> sp.....		
Tano.....	(a).....		
Imper.....	<i>Cedrela nogal</i> (?).....		

* Not classified.

Chapter III.—COLOMBIA'S SMALL LUMBER DEMAND AND ITS POSSIBLE INCREASE.

LIMITED USE OF WOOD.

Colombians are not wood users. In cities of the mountain regions, as in those of the tidewater sections, they build houses and make various commodities as if to minimize the consumption of lumber. Houses for the wealthy are altogether concrete and brick stucco, and those for the poorer classes are of adobe or of sun-baked mud blocks, reinforced with straw. In all types of dwellings, which by national custom are only one story in height, and in many other buildings, wood answers for little else than sash and doors, rafters, and more or less frequently for wide flooring. For the last use it finds serious competition in tile flooring. Wood, native or imported, has never entered into roofing. To a very large extent roofs in Colombia are thatched with an aquatic plant, similar in appearance to the cat-tail common in North America. This plant covers vast areas of lowlands of Colombia's rivers and seacoast. Elliptical clay tile of Spanish design, mostly homemade, is the common roofing material. The chief objection to it is its porosity; it does not adequately keep out water in the continuous falls of rainy seasons. The least used roofing is corrugated galvanized iron, which is an innovation but is growing in popularity.

The manufacture of wooden commodities is not an important industry. The few factories at work are small and poorly equipped and use small quantities of lumber. Box making supplies only that portion of the small demand not met by imported box shooks. Furniture and cabinet shops, widely distributed, work altogether by hand. In the aggregate they doubtless constitute the most important of Colombia's wood-using industries, but the demand for furniture is largely confined to the well-to-do, for houses of the poor laboring inhabitants, in cities as well as in rural districts, are surprisingly bare of furniture, even of articles that to the better educated seem absolutely necessary. The making of sash and doors and interior trim goes to the furniture shops. Articles turned out in this line are crude, owing not so much to the lack of skilled manual labor as to the unseasoned condition of native woods employed. Particularly conspicuous are the imperfections of doors and blinds, for they are seen in places where their defects detract from the general appearance. Other wood-consuming factories make matches, repair and occasionally build a few cars, make heavy vehicles (mostly two-wheeled carts hand-wrought in all parts), and build and repair boats and sailing craft. As might be expected, their demand for raw materials is nominal.

River boats, which take a prominent part in the Republic's commerce, have usually a two and three deck superstructure built entirely of American woods. These boats are brought to Colombia partly constructed, in sections, and are assembled on arrival. A few years ago England made an unsuccessful attempt to capture from the United States this Colombian knockdown boat trade. One of the reasons given for the failure was that the wood employed was not suitable, because the parts, being of small dimensions, lacked strength. Parts of boats or other commodities are to be credited to

consumption in the country that manufactures the sections, rather than the country that assembles them. In concluding, therefore, that wood consumption in Colombia is smaller than in most other countries of South America, partly manufactured products have not been considered. The average annual per capita consumption of the several important cities of Colombia is as follows: Bogota, 30 feet board measure; Medellin, 48 feet; Cartagena, 65 feet; Barranquilla, 74 feet.

NECESSITY OF WOOD-ADVERTISING CAMPAIGN.

Colombians use only a small quantity of wood because they know little about its serviceability. Spanish settlers taught them to mold and use adobe, and in this mode of construction they are remarkably proficient, but a neatly constructed wooden building is almost unknown in this Republic. Even fences are commonly built of adobe. Strangely enough these conditions hold, not in a country like Uruguay, Peru, or northern Chile, where there is no timber or where the stands are remote, but in a Republic where forests are plentiful and close at hand. If American lumber imports in Colombia are to be increased, the public ignorance of wood's adaptability and the economical utilization of kinds especially suitable for building and general purposes must first be considered. No permanent increase in trade can be achieved except by instituting active and intelligent advertising propaganda to show the public the advantages of wood.

The Colombian does not realize that an attractive cottage or bungalow can be built of wood at half the price that he pays for a similar dwelling of concrete. But if several model wooden houses were erected in the coast cities, they would undoubtedly attract favorable attention and might lead to the adoption of this type of building. It would be necessary in these models for the Tropics to impregnate the wood with zinc chloride or creosote oil as a preventive of damage by wood-eating ants. The weatherboarding of these buildings should be western red cedar, redwood, or bald cypress, the woods that have been found highly resistant to insect damage. Shingles should be selected from these same woods for roofing, and heart yellow pine can be used for flooring. As further protection against the entrance of termites by subterranean passages, the structure should be set on a concrete foundation and the ground that it covers should be adequately grouted with cement.

Homes built in accordance with these directions will meet the objections generally offered by natives to wooden houses. Of such preventive measures a great majority of wood users in Colombia are ignorant. Ignorance prevails also as to the great advantage of treating lumber with preservatives against decay, a problem of greatest significance in the Tropics. Facts concerning selection, adaptability, and working of lumber, and details regarding storage, piling, grading, seasoning, durability, strength, and other properties of soft-woods should be distributed in Colombia by well-directed propaganda. Without such a movement lumber consumption is going to decrease in Colombia, for substitutes are making headway under the backing of organizations that are fostering the existing prejudice against wood.

VENEZUELA.

INTRODUCTION.

Forty-five per cent of the lumber used in Venezuela is imported, and practically all the imports consist of southern yellow pine and white pine from the United States. But the total annual lumber consumption of the country is very small (about 8,000,000 board feet), and there is a marked preference for cement and other substitutes for wood. Since American exporters already send to Venezuela 98½ per cent of the lumber that that country purchases abroad, the competition that they have to meet in Venezuelan markets comes not from other countries but from other materials than wood; and this competition calls for an aggressive and well-organized lumber-advertising campaign.

This report deals with market conditions in Trinidad and in Curaçao, the principal island of the Dutch West Indies, as well as in Venezuela. The colonies were included in this study not because of market conditions similar to those of Venezuela, but because of their geographical proximity to the Venezuelan coast and the resulting close commercial relations between them and the Republic. Trinidad, 16 miles off the eastern portion of Venezuela, from the delta of the Orinoco River, is the market center for this rich river valley and southern Venezuela; and Curaçao, because of navigation difficulties at the entrance of the Bay of Maracaibo, is the point of transshipment for the greater portion of the large quantity of goods carried into and out of Venezuela through the port of Maracaibo.

Chapter I.—GENERAL DESCRIPTION OF THE COUNTRY.

Venezuela is composed of 16 States, comprising an area of approximately 600,000 square miles and supporting an estimated population of over 2,500,000. Not more than one-tenth of the population, it is considered, are whites, the rest being mostly Indian and mixed bloods of white and Indian; the proportion of negroes and mulattoes is very small.

INDUSTRIES.

AGRICULTURE AND STOCK RAISING.

A mild climate, copious rains, excellent drainage, and a fertile soil adapted to varied crops combine to render Venezuela one of the most promising and profitable agricultural countries of the Western Hemisphere. It has often been said that a population one hundred fold greater in this Republic would have no difficulty in deriving a comfortable subsistence from the soil.

COFFEE, SUGAR, TOBACCO, ETC.

Coffee is the chief product of Venezuela and is first in commodities exported. Next to Brazil, Venezuela produces the largest coffee sup-

ply in the world, although the output is considerably below that of Brazil. It is estimated that there are over 300,000,000 coffee trees in the Republic, and the average production is nearly 1,250,000 bags. Coffee in Venezuela must be raised in the shade of trees, usually the bucare (*Erythrina umbrosa*), but frequently the guamo tree (*Inga laurina*). A considerable part of Venezuela's production is graded as coffee of the highest quality, especially that raised in the western mountains and shipped to the United States from Maracaibo.

Sugar, the most general crop in Venezuela, is cultivated with excellent results, and is of growing commercial importance. The largest part of the production comes from extensive plantations conducted on a large scale. Sugar, alcohol, and rum are the products. Besides individual plantations that have limited manufacturing facilities for cane products, the Republic has four sugar mills with modern equipment, capable of handling 400 and 600 tons of cane per day. The larger mill was recently built in the city of Maracay. Cane distillation for rum and alcohol constitutes an important industry and a valuable source of revenue.

Venezuelan tobacco of excellent quality is being cultivated in many parts of the country. The manufacture of tobacco products is a profitable and fairly large industry. The small part of the crop exported is in demand in Habana for making the noted Habana cigars.

Other products of the soil are corn, beans (principally the black beans that are one of the staple articles of food), and wheat raised in large quantities on the high tablelands and mountainous regions of western Venezuela.

STOCK RAISING.

From the second range of mountains parallel to the Caribbean coast, descending gradually to the Orinoco River, are vast areas of plains in Venezuela which are called llanos. These are covered with a nutritious native grass, excellent for pasture. By virtue of these conditions stock raising has been developing of late years until it has become of considerable importance. These plains are the chief source of the meat supply of Venezuela and a number of thickly populated islands of the West Indies. However, there are great opportunities for the further expansion of the industry. A large frigorifico in Puerto Cabello slaughters many thousand head of Venezuelan grass-fed cattle for the exportation to European countries of chilled and frozen meat.

MINING.

Mineral deposits of nearly every known kind have been located in Venezuela. Except a few instances of gold production, one of copper mining, and certain oil-well and asphalt developments, the exploitation of minerals has not been given attention by concerns with large capital and a knowledge of modern mining methods. In 1912 the exports of gold were valued at \$584,000, of copper at \$321,000, and of iron ore at \$42,000.

Large sums of money have been expended in the Maracaibo region for petroleum prospecting. One big corporation has been successful in locating a number of large producing wells, among which is one of the largest in the world. Modern extracting and loading

equipment is being installed, and a plant will be erected for the production of refined oil. This industry in a short time will doubtless take the lead in the mineral output of Venezuela.

In the eastern part of Venezuela, in the delta region of the Orinoco, there exists a vast supply of asphalt. The land of this part of the Republic, which is called Pedernales, is low, intersected by small streams. In numerous ponds of brackish water is found the asphalt known as Pedernales asphalt, which is said to contain a greater percentage of oils and less solid matter than Trinidad asphalt. It is remarkably pure and strongly adherent. The corporation that exploits the Trinidad asphalt controls the deposits in Pedernales. There are several other asphalt deposits in Venezuela. The Maracaibo Lake section contains a series of small asphalt lakes, for exploiting which facilities have been developed but not yet extensively worked.

FOREST PRODUCTS.

CACAO AND RUBBER.

No country possesses conditions better suited for growing cacao, the bean from which chocolate is made, than Venezuela. Considerable progress has been made in the development of cacao plantations, but only a small proportion of the country's average 10,000-ton crop is taken from cultivated trees. The wild tree, yielding the criollo cacao, is much appreciated for its quality. It grows in the forests in valleys, where the temperature is warm and moist in many parts of Venezuela. The Republic's annual exports of cacao before the war were more than \$2,000,000.

Besides rubber forests south of the Orinoco River, which cover vast areas, the rubber tree is found in frequent stands in many States of the east, west, and south of Venezuela. The exploitation of only a small portion of the rubber forests has been undertaken. The production of rubber in the Republic is less than it was before the product of cultivated plantations of the Far East began to compete with rubber from South America. Venezuela has started a cultivated-rubber industry with several large plantations, the production of which has not yet assumed commercial importance. There are several species of wild rubber tree that exude gum, intermediate in quality between india rubber and gutta-percha, some varieties of which are commercially termed "balata." Exports from Venezuela of rubber (including balata) were valued at \$2,375,000 in 1912.

TONKA BEANS, VANILLA, AND COPAIBA OIL.

The tonka bean constitutes one of the staple and most valuable products of the region in Venezuela drained by the Orinoco River. The shrublike tree that yields this fruit is known scientifically as *Dipterix odorata*. The seeds, which are long and black, when dried yield a delicious perfume and are used largely for flavoring tobacco. Almost the entire Venezuelan crop of this commodity is exported by the way of Ciudad Bolivar. In 1912 it was valued at \$150,000.

Venezuela's forests produce a vinelike vanilla plant, which has been classed botanically as *Vanilla lutescens*. While the product is valuable and plentiful throughout the northwestern sections of the

Republic, only a small portion of the crop is harvested. The cultivation of vanilla has been started in a small way.

Copaiba balsam, a resinous extract from a tree known as cambima and scientifically termed *Copaifera officinalis*, is common in the forests of the Orinoco Valley and the basin of Lake Maracaibo. The exports of copaiba oil in 1912 were valued at \$38,000.

CHICLE.

The Venezuelan production and exportation of chicle, used for chewing-gum manufacture, is assuming greater commercial importance each year. No attention was given to gathering and preparing this substance for market in this Republic until 1910, when 578 pounds were exported. In 1912 the exports amounted to 3,873 pounds; in 1913, to 66,498 pounds; in 1914, to 131,919 pounds; and in 1915, to 952,000 pounds. All the chicle is consigned to New York and purchased direct by the chewing-gum manufacturers.

The commodity is known in Venezuela by two names, chicle and pendare. The former was a new name brought by Americans, and the latter, after the local name of the tree from which it is drawn, has always been the term by which this sappy substance was described. The Government, not recognizing these two names as the same product, granted concessions giving to one concern exclusive control of the gathering, production, and exporting of chicle and to another the gathering, production, and exporting of pendare. The two names are commonly used in the export trade. Venezuela's production of chicle is centered in the Orinoco Valley, Ciudad Bolivar being the only port from which the exports have originated.

The tree that yields chicle in the forests of southern Venezuela is the same species from which chicle is obtained in Mexico and Central America. In Venezuela, until lately, it was better known for its yield of a delicious fruit called sapodilla, seen in abundance with mangoes and avocados (alligator pears) in the markets of various tropical countries of the Western Hemisphere. Chicle is made from the sap, gathered by tapping the trees at certain seasons. The natives use their machetes for the V-shaped incisions of the bark. The sap, of a light grayish color, is brought to the proper consistency by boiling. A primitive process is employed for this work. The industry promises to develop because of the excellent opportunities afforded by Venezuela's forests and the fact that trees may be tapped continuously for 8 to 15 or more years.

Other products from Venezuela's forests include materials suitable for the production of tanning extracts and dyestuffs, which will be referred to later.

COMMERCIAL DIVISIONS AND PRINCIPAL CITIES.

Commercially the Republic may be said to be divided into regions according to port cities. Maracaibo, the center of a wonderfully productive region, is reached by way of Lake Maracaibo and near-by sections of eastern Colombia. Puerto Cabello, besides its own State, serves the extensive and rich interior territory of Lara, Zamora, and parts of the States of Tachira and Trujillo. La Guaira is the port for the largest city, Caracas, and the populous region beyond, and

is reached by railroads and good wagon and automobile roads. Carupano may be considered the principal port center of the oriental region, while Ciudad Bolivar answers in a similar capacity for the Orinoco River region.

The Maracaibo section is the scene of the greatest lumbering activities in the Republic, and Puerto Cabello is next. Puerto Cabello and La Guaira are the only ports in which shipments of foreign lumber have ever been regularly received.

The principal cities, their population, and their industries, which indicate their importance as markets, are as follows:

Cities.	Popula-tion.	Industries.
Caracas.....	110,000	Railroading and interior distribution; seat of Federal and State Governments; horticulture; manufacture of lumber, cigars, and cigarettes, chocolate, rum, paper, corn flour, beer, ice, shoes, soap, candles, matches, brandy, and soda water; sugar mills.
Cumana.....	10,000	Raising of coffee, beans, sugar, hides, tobacco, pineapples, and grapes; mining of rock salt.
Carupano.....	11,500	Raising of coffee, sugar, and cotton; manufacture of straw hats, grass ropes, pottery, soap, and fine rum.
Ciudad Bolivar.....	12,000	Live stock (cattle, horses, and mules); forest products (tonka beans, rubber, sarsaparilla, cacao, copaiba oil, and chicle); raising of coffee, tobacco, and fruits; manufacture of ice, candles, soap, cheese, and ceramics.
Valencia.....	40,000	Interior distribution; live stock (cattle, hides and skins); raising of sugar, coffee, and cereals; manufacture of cotton textiles, plows, distilled spirits, furniture, shoes, chocolate, macaroni, soap, candles, and refined sugar; foundry; tanning.
Barquisimeto.....	32,000	Shipping; live stock; raising of cereals, coffee, cacao, beans, and sugar; manufacture of rum, sugar, sacks, ropes, hammocks, and candles.
San Cristobal.....	14,000	Forest products (vanilla beans and cacao); raising of cereals, tobacco, rice, and sugar; mining of copper, silver, iron, coal, and petroleum.
Maracaibo.....	52,000	Shipping and interior distribution; stock raising; fishing; raising of sugar, corn, bananas, coconuts, tobacco, rice, cotton, and coffee; forest products (cacao, fustic, mangrave bark, divi-divi, copaiba oil, lumber, and furniture woods); manufacture of flour, sugar, rum, and chocolate; saw mills; mining of coal, petroleum, salt, and asphalt.
Puerto Cabello.....	14,000	Harbor; railroad and distributing center; forest products (lumber, dyewood, mangrove bark, cacao); manufacture of refrigerated beef, lumber, candles, soap, and rum; raising of beans, coffee, cotton, tobacco, hides and skins.

Chapter II.—NATIVE WOODS AND THEIR UTILIZATION.

The virgin forests of Venezuela are roughly estimated to cover an area of over 160,000 square miles. They range in valleys and in the mountainous and tidal flats of north Venezuela from around Lake Maracaibo eastward through the States of Trujillo, Lara, Zamora, etc.; in the east and the river valleys of the Guayana section; and in vast areas in the Amazon region, the unsettled and little-known territory between the two great rivers, Orinoco and Amazon. In these tropical forests the foliage is green throughout the year. In the Torrid Zone, with a great number of rivers, lakes, and an abundance of rain, with an extensive sea coast, high mountains, wide plains, etc., Venezuela perhaps deserves its reputation of possessing the richest flora in the world. Therefore the fact that the forests contain over 600 species is not surprising, but the fact that the stands are mixed and only 5 to 10 per cent is marketable constitutes the greatest of many difficulties encountered in the commercial exploitation of tropical forests and is an important element in the high cost of production of native lumber woods in Venezuela.

LUMBER WOODS.

MAJAO, JAVILLO, AND CEDRO.

Majao and javillo are the cheapest woods. They produce inferior lumber, naturally defective, susceptible to extensive checking, and, like many other light, soft, tropical hardwoods, very porous and exceedingly perishable. These woods answer mostly for boxes, crating, and temporary structural uses, such as concrete forms. Experiments with javillo for match stems proved that the wood is not suitable for this purpose.

Cedro, which closely resembles mahogany, goes into commerce in the United States as Spanish cedar. It may be judged from the high market prices that the wood is either more difficult to put on the market or less abundant in Venezuela than in many other South American Republics. The high price of the wood in the principal market has made its uses more limited in Venezuela than in any of the other South American Republics except Chile. The furniture makers employ it most extensively for high-grade and ornate work. It is also utilized for expensive front doors, but not often for standard sash and doors.

WERA, APAMATE, CANALETE, AND ROBLE.

Vera is one of the lignum-vitæs of commerce, and frequently is referred to in the United States as Maracaibo lignum-vitæ, although shipments of the wood also originate in the Guianas, Colombia, and Brazil. The tree reaches much larger and more uniform sizes than the true lignum-vitæ, guayacan (*Guajacum officinale*). Vera is superior to guayacan as a lumber wood because its sizes are more convenient and it is more easily worked. In Venezuela it is prized for a number of important commercial uses, including flooring, furniture, fixtures, caskets, etc. The color is dark-brown, and the wood is hard, close-grained, heavy, and capable of taking a high polish. It is one of the most valuable native lumber woods on the Venezuelan markets.

Apamate represents the native lumber most used for rough structural purposes. It is not durable in the open, and is liable to attacks by insects. It is also employed for flooring and interior finish.

Canalete is found among native stocks in Colombia and Ecuador, but is doubtless most abundant in Venezuela. It is popular for furniture and fixtures; the brownish color, richly mottled, makes a most attractive finish. The wood, straight-grained, is easily and regularly split, and is therefore widely used by the Indians for oars and paddles. When freshly cut, canalete is not difficult to work, but after seasoning it becomes almost too hard to saw.

Like canalete, roble has an extensive range, being found among the much used native woods of Ecuador and Colombia, as well as Venezuela. The tree commonly attains large dimensions. It is employed in Venezuela for rough structural uses, flooring, and furniture.

ZAPATERO, ANGELINO, ARAGUANEY, PUY, AND PARDILLO.

Zapatero is probably the most important Venezuelan wood for export. It is known in the United States as West Indian boxwood,

and is used for rulers, sticks, and shuttles, having largely superseded the more expensive European boxwood for these uses. In Venezuela the heartwood, with its yellowish color and natural satiny luster, is esteemed for furniture but is little used because the tree seldom grows large. Being strong and resistant to insects, zapatero, in the round, pole size, is frequently employed, in the hot zones, for rafters for Spanish tile roofs.

Angelino is not as hard as many of the tropical woods that are highly favored for fine furniture work. The dark-olive color of the heartwood, with its compact, fine, even grain, puts angelino among the foremost cabinet woods in Venezuela. Araguaneý belongs to the same class. It is not dissimilar in color to angelino, but is unlike it in being among the woods noted for great hardness and high specific gravity.

Puy, or poui, is regarded as the foremost Venezuelan lumber for outdoor uses because of its proved durability. Furthermore, it is an ideal wood for turnery work. It is in great demand by vehicle builders, and carpenters use it occasionally for making tables and chairs. Puy is often classed with pardillo, another Venezuelan wood not too difficult to work, susceptible of high polish, and much favored for cabinet work and furniture.

WOODS VALUED FOR THEIR TANNIN CONTENT.

Venezuela offers an excellent opportunity for developing a large and valuable industry—the utilization of forest products of noted value for producing tanning extracts.

Divi-divi (*Cæsalpinia coriaria*) is probably found in more frequent stands in Venezuela than in any other country. The legumes, or pods, are esteemed for their rich tannic-acid content, which runs as high as 40 to 50 per cent. The pods contain 8 to 10 per cent of other commercial substances.

Venezuela in times of normal business exports an average of 5,000 to 6,000 metric tons (1 metric ton=2,204.6 pounds) of dried pods. Germany, France, England, and the United States, in the order named, are ready purchasers. The supply outside of Venezuela is furnished by Curaçao, Ecuador, and Colombia, amounting in the aggregate to not over 2,200 tons. If the industry were large enough to utilize the country's entire divi-divi yield the production would be increased several fold in Venezuela. As it is, only that part of the crop which is readily available is harvested and marketed.

Divi-divi ordinarily sells in Maracaibo at \$17 to \$18 per metric ton. In France before the European war the tannin extract on the open market brought about 9 cents per pound.

The fruit and bark of cuji (*Acacia macracantha*) and other acacias are well known as being rich in tannin. Liquid extract made in Belgium from the species named sold before the war, it is said, at 40 to 45 francs per 100 kilos (\$3.50 to \$3.95 per 100 pounds).

Red mangle, more widely known as mangrove bark, is largely exported to Europe and the United States. The bark contains 22 to 33 per cent of tannin, according to the age of the tree. The leaves are claimed to yield nearly 20 per cent, and the wood also has a tannin value. There are almost unlimited stands of mangle in Venezuela. It grows abundantly in all parts of the coast region,

and in the delta section it is available in enormous quantities. Mangrove bark brings \$4.60 to \$6 per metric ton at different points in Venezuela. The powdered extract in France is worth 50 to 60 cents per pound under normal conditions.

Still another tree containing tannin is commonly called uva de playa, or beech grape (*Coccoloba uvifera*), which is frequent and accessible in the tidewater sections, especially in the eastern region. The tree, which yields an extract rich in tannin and exceedingly astringent, has no commercial value in Venezuela as it has in several islands of the Antilles. The dry extract obtained from the wood in the West Indies is called kino de Jamaica and is said to contain 50 per cent of tannic acid.

Among other woods valuable for tannin in Venezuela are gateado (*Astronium graveolens*), the bark of which contains 25 to 30 per cent of tannin; curtidor (*Weinmannia glabra*), which has a bark yielding 16 per cent of tannin; and amarillo (*Aspidosperma vargasii*), curtidor de Sabana (*Byrsonima spicata*), saw bark (*Weinmannia balbisiana*), and guayabo (*Psidium guava*).

DYEWOODS.

The forests of Venezuela are said to contain also a number of available woods valuable for dyestuffs. Among them are mora and fustic (*Chlorophora tinctoria*), the latter yielding the well-known yellow dye. Considerable quantities of this wood have been exported from Venezuela to France. The bark of the ontillo (*Vismia ferruginea*), it is claimed, yields a reddish resinous substance, which slightly resembles and can be used like gamboge, while the bark of amarillo (*Aspidosperma vargasii*) contains a yellowish dye.

Onoto (*Bixa orellana*) has seeds called arnatto seeds, covered with a deep-red pulp that is easily separated when the seeds are dry. This forms the arnatto of commerce, used for dyeing and for coloring varnishes. The primitive Indians use the bright coloring matter from these seeds for painting their faces and bodies.

According to information from reliable sources and exhibits of the Agricultural Museum, the Venezuela forests contain campeche, or logwood (*Hæmatoxylon campechianum*), the valuable red dye-wood, and also the similarly used Brazilwood (*Hæmatoxylon brasiletto*). Brazilwood, it was learned, has been among articles of export from Maracaibo, but concerning the logwood there was no information available in any of the principal ports visited. It is doubtful, therefore, whether the tree has ever been commercially exploited.

Chapter III.—THE LUMBER MARKET.

CONSUMPTION OF DOMESTIC AND IMPORTED WOODS.

The following table indicates the low lumber-consuming capacity of Venezuela as compared with Trinidad, under English influence, and Curaçao, under Dutch influence. This compilation shows estimates of the total lumber consumption in Venezuela (Caracas, Puerto Cabello, and Maracaibo), Trinidad, and Curaçao, and the relative amounts of domestic and imported woods. Nearly all the lumber sold in the markets of Venezuela other than Caracas, Puerto

Cabello, and Maracaibo consists of hand-sawed boards from native woods.

Countries and woods.	1913		1914	
	Quantity.	Value.	Quantity.	Value.
VEZUELA (CARACAS, PUERTO CABELLO, AND MARACAIBO).				
Southern yellow pine.....	2,460,000	\$71,943	3,200,000	\$94,920
White pine.....	458,000	21,432	220,000	11,048
All other imported woods.....	212,000	9,270	50,000	2,872
Native woods.....	4,670,000	246,200	4,250,000	285,000
Total, 3 Venezuelan markets.....	7,800,000	348,845	7,720,000	363,840
TRINIDAD.				
Imported woods.....			11,450,000	247,143
Native woods.....			4,732,000	224,808
Total, Trinidad.....			16,191,000	582,011
CURAÇAO.				
Imported American woods.....			1,500,000	43,500
Venezuelan hardwoods.....			250,000	15,000
Total, Curacao.....			1,750,000	58,500

The per capita consumption of lumber in the three principal markets of Venezuela, which have a total population of 176,000, is only 44 feet board measure per year, while in Trinidad (counting the principal cities and the developed rural sections) the per capita consumption is 102 feet, and in Curaçao, 56 feet.

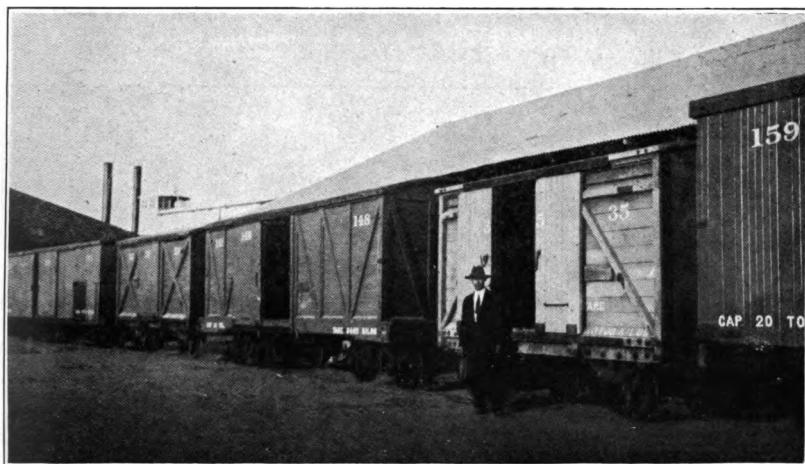
Only two Venezuelan markets include imported woods in the lumber carried in stock—Caracas and Puerto Cabello. Maracaibo has always depended on local timber stands for the sources of its lumber. Lately, however, the increasing cost of production of logs, because cutting has removed forests farther from river courses, has put the market prices of certain native woods so high that imports of American lumber are beginning to be considered.

Southern yellow pine from the United States and northern white pine, cut largely from Canadian forests, are the principal imported woods coming to Caracas and Puerto Cabello. Both woods come in pieces measuring 12 by 12 inches. American hardwoods, principally poplar, ash, and white oak (planed lumber, flooring, etc.) have been received in board form in very small consignments, always by certain corporations or individual concerns enjoying exemption from duty through franchise concessions. These woods rarely appear on the markets.

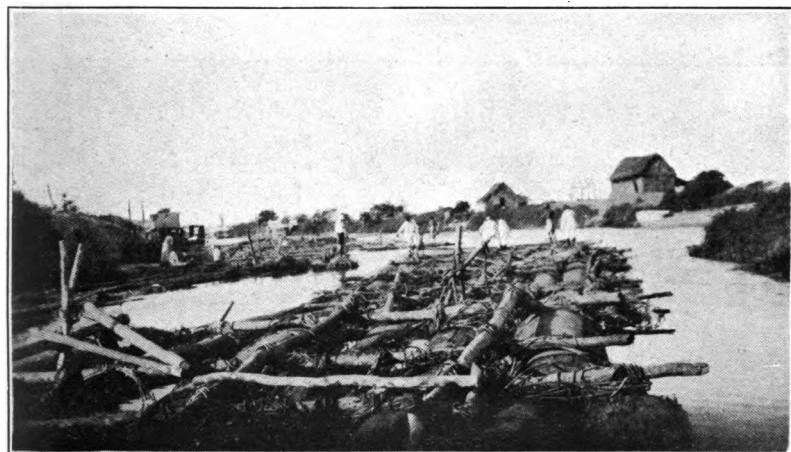
DUTIES.

Of special interest in the international lumber trade with Venezuela is the fact that pine imported in timber form above specified dimensions is admitted duty free. The given size for thickness and width is 25 centimeters square, interpreted in the actual lumber trade as roughly equivalent to 10 by 10 inches. But the law requires that pieces imported must be above these dimensions to be exempt from duty; therefore the size of the nearest American standard is 12 by 12 inches. Hardwoods in timber form, of the same size, are

Special Agents Series No. 117.



20. BOX FREIGHT CARS IN BARRANQUILLA, SOME OF WHICH IN COLOMBIA
ARE MADE OF AMERICAN WOODS.



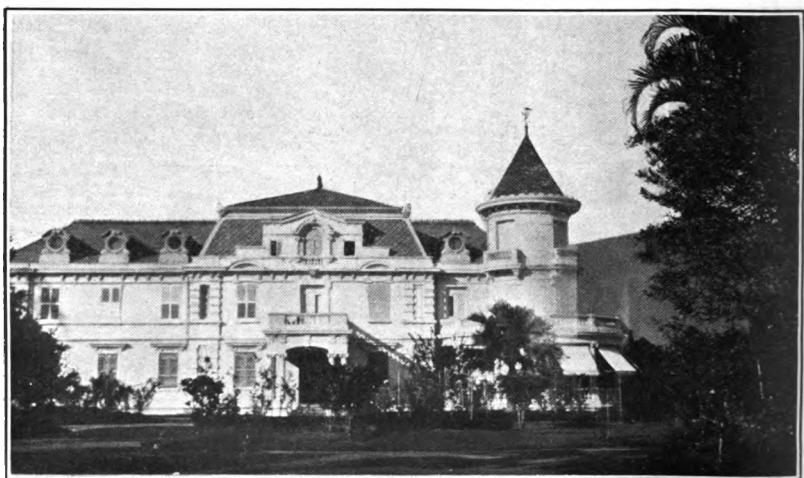
21. A RAFT OF MAZABALO LOGS AT A BARRANQUILLA SAWMILL. NOTE THE
LARGE SIZES AND THE CUSTOM OF TYING THE LOGS WITH VINES.



Special Agents Series No. 117.



22. COMMON TYPE OF DWELLING IN VENEZUELA.



23. MOST EXPENSIVE TYPE OF DWELLING IN VENEZUELA.

taxed about \$19.30 per 1,000 feet, while for small-dimension boards and deals, either pines or hardwood, the duty is about \$38 per 1,000 feet. To these duties must be added the surtax, equal to 56.55 per cent of the duty. Dressed lumber is dutiable at more than twice the rates on undressed planks, while manufactures of common wood, not specified, are dutiable at much higher rates.

The policy of exempting large dimensions from duty and levying a prohibitive duty on small-size lumber and planed material carries out the twofold purpose of protecting the local resawing and planing-mill industries of the Republic, and of affording consumers the opportunity of using coniferous woods, with which the native woods, because of dissimilar properties, do not compete. It seems, however, that the provision of the Venezuelan tariff schedule pertaining to minimum sizes of softwood imports might be modified in the interest of lower prices and without prejudice to native woods. For instance, where heart is stipulated to show on faces to a specified requirement, as with yellow pine, or where the run of remaining forest stands, as in the case of northern white pine, is infrequently large enough to produce a 12 by 12 dimension in regular lengths, it is apparent that the necessity of sending special stock makes the market price high. If the exempted sizes were revised to include 8 by 8's, and even 4 by 10's and 4 by 12's, these dimensions could be more easily procured and at the same time would find few, if any, uses in Venezuela that did not involve resawing. This belief is corroborated by the experience with regard to resawing foreign softwoods in Brazil, Argentina, and Peru.

PORt AND DISCHARGING FACILITIES.

Both at La Guaira, the port of Caracas, and at Puerto Cabello there are excellent port facilities and depths to accommodate the largest ocean steamers passing over the Spanish Main.

Puerto Cabello is considered the best port in Venezuela, but the greatest export activity is at Maracaibo, and the largest volume of imports received is at La Guaira. The docks in La Guaira are controlled by foreign interests, to whom has been granted an exclusive franchise covering a long period of years. The charges at La Guaira for dock privileges and hauling ashore over the mole are on a basis of weight (2 bolivars for 100 kilos, equivalent to about \$6.50 per 1,000 feet b. m.). Lumber, principally southern yellow pine, has been brought to Maracaibo only by private users. It does not appear on the markets. As is necessary for all merchandise consigned to this port from abroad, transshipment is made usually at Curaçao and occasionally at La Guaira. Upon the arrival at Maracaibo of the vessels from Curaçao, having a draft of not over 12 feet, the cargo is discharged onto the wharf, but the facilities are not modern. For receiving lumber and conveying it ashore a dock company charges at the rate of \$4.30 per 1,000 feet. In almost all other ports of this Republic, including those on the Caribbean Sea and along the Orinoco up to Ciudad Bolívar, cargo discharge is by lighters. Foreign lumber or timber, however, rarely finds its way to any of the Orinoco ports.

MARKET PRICES.

Caracas receives three-quarters of the lumber imports, which total not more than an average of 3,000,000 feet a year. This market is the point of the largest lumber consumption in Venezuela, and southern yellow pine is the most popular wood. The demand for imported woods would be much greater but for very high selling prices. An item of expense contributing largely to high prices is the freight from La Guaira to Caracas. The rate on lumber for the 23-mile rail haul amounts to 30 bolivars per ton, equal to about \$10 per 1,000 feet. Including handling charges, with dock dues and freights, lumbermen figure the cost of removing imports off the boat at anchor in La Guaira to dealers' storage or lumber yards in Caracas at \$18.75 to \$20.15 per 1,000 feet. All the advantage gained by the duty exemption on softwood timber from the United States or elsewhere is offset by these high charges for wharfage and transportation to market from port. Moreover, these charges, according to the terms of the franchise, are to continue for 60 years.

The normal market prices, so far as they could be ascertained, of the woods appearing on the principal markets of Venezuela, and their common and scientific names are as follows:

Kinds of wood.	Caracas.	Puerto Cabello.	Maracaibo.
	Per 1,000 ft.	Per 1,000 ft.	Per 1,000 ft.
Pitch pine (<i>Pinus palustris</i>).....	\$100.00	\$97.00	
White pine (<i>Pinus strobus</i>).....	112.00		
Javillo (<i>Hura crepitans</i>).....	65.00	70.00	\$36.00
Milao (<i>Anacardium rhinocarpus</i>).....			
Celbo (<i>Eriodendron anfractuosum</i>).....	100.00		50.00
Cedro (<i>Cedrela odorata</i>).....	130.00	90.00	65.00
Caoba (<i>Cariniana pyriformis</i>).....	160.00	130.00	120.00
Vera (<i>Guajacum arboreum</i>).....	175.00		100.00
Ayamate (<i>Tabebuya sp.</i>).....	106.00	85.00	60.00
Canalite (<i>Aripidosperma excelsa</i>).....	120.00	98.00	
Roble (<i>Tecoma pentaphylla</i>).....	130.00	95.00	
Carreto	136.00		66.00
Balsamo (<i>Elaphitium incutinianum</i>).....	140.00	120.00	88.00
Zapaterio (<i>Peltogyne floribunda</i>).....			
Angelino (<i>Homalanthus racemosum</i>).....	135.00	120.00	
Araguaney (<i>Tecoma spectabilis</i>).....	120.00		
Laurel (<i>Nectandra turbucensis</i>).....	140.00		
Puy (<i>Tecoma serratifolia</i>).....	125.00		
Pardillo (<i>Cordia gerascanthus</i>).....	110.00		

* Scientific name unknown.

CARACAS.

Both native and imported woods are brought into Caracas by way of the port of La Guaira. They come in sailing boats, usually from Maracaibo, but occasionally from Puerto Cabello. It would seem that there must be big profits in handling domestic woods, since they sell at higher prices than imported woods. The reverse, however, is the fact. The highest profit on lumber in Venezuela is made on American southern yellow pine and northern white pine; the average margin of profit is nearly \$20 per 1,000 feet more in the case of the imported woods. Yellow pine, delivered in Caracas, costs \$50 to \$55 per 1,000 feet, white pine \$60 to \$75, compared with \$75 to \$90 in Caracas for native hardwoods. All woods are brought to the capital market in squared pieces. The domestic woods are hewn square, while the American products are sawed to sizes not less than 12 by 12's. Therefore all are resawed before they are marketed.

The dealers' purpose is to keep the prices of imported woods high so as not to prejudice the market interests of native woods. It would encourage greater wood consumption and would therefore not lessen the aggregate profits if the percentage of profit on softwoods were considerably lessened from its present basis of 76 to 82 per cent.

PUERTO CABELLO AND MARACAIBO.

The consumption of lumber in Puerto Cabello is small. The city, as has been previously pointed out, is only one-eighth of the size of Caracas and a little over one-fourth of that of Maracaibo. The native woods are brought in largely by rail over the Puerto Valencia Railway, but the distance from forests to the nearest rail siding is great and transportation by ox carts is costly.

Maracaibo is the lumber center of Venezuela. Most of the woods leaving this port are in the form of square logs, but considerable quantities of boards and planks are loaded. The sawmill industry is more important here than elsewhere in the Republic. The woods are cut from forests long distances in the interior, usually along the course of the numerous rivers and streams emptying into Maracaibo Lake. The cost of preparing floats for buoying small rafts of these heavy tropical woods to boat landings and hauling them in barks across the lake to Maracaibo accounts largely for their high market prices. With the forests cut farther and farther back from the river banks, the cost of logging is constantly going up. It was this situation that recently prompted the first inquiry from this market for quotations on a cargo of southern yellow pine.

INADEQUATE OCEAN TRANSPORTATION FACILITIES.

Sailboats do not bring all of the southern yellow pine to Venezuela. Before the war a considerable amount, though probably not more than a quarter of the supply, was transported in parcel lots by steamers. The normal freights for schooners were \$9 to \$11.50 per 1,000 feet board measure. At present quotations are equivalent to nearly \$26 per 1,000 feet. Steamer rates from New York in times of normal business amounted, by actual experience, to \$15 or \$17 per 1,000 feet, according to weight. Consignments unloaded at Curaçao destined to Maracaibo had to pay to steamers additional transportation of \$3 per ton, or about \$6 per 1,000 feet. At present general-cargo steamers from New York, it is reported, will not accept lumber for Venezuela, owing to the greatly increased volume of business.

Aside from lumber imports, an American viewing the general trade situation in Venezuela is impressed with the need of adequate steamship facilities from the United States to La Guaira, Puerto Cabello, etc., to handle with some degree of promptness the greatly increased business. In 1913, from June to December, the United States furnished nearly 48 per cent of the tonnage of imports to Venezuela, and European countries 49 per cent. In 1915, from January to June, the United States furnished more than 75 per cent of the total receipts. To handle the European business before the war, French, Spanish, Dutch, German, Italian, and two English steamship lines maintained regular sailings, and most of the boats carried over 8,000 tons. Since the war started, four lines continue to operate. For the trade between the United States and Venezuela there are only

two lines (American and Dutch), which have no steamers of more than 3,000 tons capacity. The two companies, moreover, working under a trade agreement to eliminate competition, have divided the business in such a manner that only one line serves each of the important ports, where about 74 per cent of the imports are unloaded.

United States-Venezuela trade is greatly hampered by the inadequate ocean transportation facilities, which have caused a serious congestion of merchandise awaiting shipment. An automobile dealer in Caracas reported that 40 machines ordered by him had been on the docks in New York for more than six weeks and that their shipment would have to be further postponed until the docks were cleared of large quantities of merchandise that had been waiting for a still longer period. If the present favorable opportunity for establishing another line of steamers connecting the United States and Venezuela is not seized, much of the trade that has come to the United States as a result of the abnormal conditions in recent months will at the close of the war be diverted to its former European channels.

EXTENSIVE USE OF SUBSTITUTES FOR WOOD.

The high prices at which lumber is sold in Venezuela, especially in Caracas, may in part account for the country's low rate of lumber consumption. In comparison with the price of substitutes for wood (cement, brick, steel, and iron), the price of lumber in Venezuela is higher than in other parts of South America. It is true the costs contributing to high market prices represent the same ratio for wood as for other materials in Venezuela, both imported and domestic. Conditions are not similar, however, for fixing profit margins; they are unfavorable to wood. Expensive as it is, however, lumber is the cheapest construction material. It is little used, the chief setback being the prevailing ignorance concerning the remarkable properties, adaptability, and economic structural value of wood, especially softwood. The Venezuelans, who formerly used stone, brick, and adobe, have begun to build with cement and steel, like the people of other South American countries. Instead of the American policy, "Use wood where wood is best," the Venezuelan builders believe that the best construction is that in which wood is used least. Lumber for mill and warehouse construction, as commonly and increasingly employed in the United States, would be of great advantage in the development of Venezuela, but it is hardly known there.

The attractiveness of wood dwellings of the cottage and bungalow types, their advantages as to inside atmospheric conditions in both hot and cold climates, their durability, and above all their economy in cost of material and construction, are matters little known, and there is no movement by dealers nor any organization to further lumber consumption and to spread information concerning its value and proper use. Moreover, the situation leaves no influence to offset the growing opposition to wood, due to the active propaganda work of handlers of imported cement and steel products.

These statements repeat in part what has been said of the need of lumber propaganda in other South American countries. What has been written on the subject in those reports and omitted here is fully as applicable to Venezuela and as significant in connection with trade expansion.

TRINIDAD.

Chapter I.—GENERAL DESCRIPTION AND FOREST RESOURCES.

Trinidad lies only 16 miles off the east coast of Venezuela near the delta of the Orinoco River. Usually Trinidad and Tobago are referred to together, being administered as one British colony and closely affiliated in trade and customs. Since Tobago became a ward of Trinidad in 1899 it has grown rapidly and made considerable commercial progress, but in connection with this study it is relatively unimportant, having a population of not over 20,000 and an area of only 114 square miles.

INDUSTRIES AND TRADE CENTERS.

Trinidad, with an area of about 2,000 square miles, is the second largest of the British West Indies. With its 355,000 inhabitants and its natural advantages, modern improvements, and excellent government, it is constantly developing into greater commercial importance. The salubrious climate, sufficient rains, productive soil, and cheap labor have made agriculture the backbone of the colony's industrial life. While sugar and cacao are the staples, other products of the soil important to mention are coconuts, coffee, bananas, oranges, tobacco, and rubber.

The Government, through experiment stations and scientific research, is doing much to encourage the farming industry. Moreover, the maintenance of a governmental organization under technical administration gives the island the advantage of a progressive, intelligent forest policy.

The mineral deposits in exploitable quantities are asphalt and petroleum. Trinidad has been for many years the source of the largest production of natural asphalt, which is shipped to all parts of the world. The lake, 104 acres in area, locally called Pitch Lake, is considered to be the crater of an extinct volcano. Crude asphalt continues to be taken from the lake, which shows a barely perceptible diminution in the supply. In 1912 the production amounted to about \$315,000, part of which is submitted to refining in local plants. The refined product is put up for market in wooden barrels. A large quantity of slack staves, therefore, is annually brought from North America to Trinidad.

Oil production in Trinidad is not a new industry, but in recent years it has had most remarkable growth. In 1914-15 the official record of petroleum produced was 36,954,000 imperial gallons (1 imperial gallon=1.2 American standard gallons), whereas in 1866-67 the production was only 3,000 gallons. Wells recently struck yield, it is claimed, as much as 40,000 barrels per day.

Port of Spain, a city of 64,000 inhabitants, is the metropolis and the seat of the insular government. It is a modern city, the commercial center of Trinidad and Tobago Islands, and the distributing

point and market place for the rich Orinoco Valley of Venezuela. Nearly all merchandise from abroad destined for Ciudad Bolivar and other towns along the Orinoco come to Port of Spain for transhipment, and exports from the Orinoco region of Venezuela are shipped via the same route.

Trinidad's second important city is San Fernando, with over 9,000 inhabitants, which is the center of the Sujor district, while La Brea (Brighton) has asphalt and part of the petroleum fields as its principal industries. There are numerous other towns on the island, but none with more than 7,000 inhabitants.

While there is a large negro population, the principal laboring class is the East Indians and their descendants, who have been immigrating to Trinidad with the help of the Government for more than 70 years. They work for smaller wages than negroes and are indentured to the planters for a term of years.

PRINCIPAL LUMBER TREES.

For the information on which are based the following descriptions of the native lumber woods in stock in Trinidad markets the writer is indebted to the Forest Officer of the Colonial Government. The values given are first costs of the woods delivered wholesale at Port of Spain in the form of squared timbers.

CEDAR AND BALATA.

Cedar (*Cedrela odorata*) is known in Europe as West Indian cedar. It is a large tree 60 to 80 feet high and 4 to 6 feet in diameter. The wood is red or brown, splits easily, and is soft and porous. It has a strong and pleasant scent, and for this last reason is much used for wardrobes and other articles of furniture. It weighs about 36 pounds per cubic foot, and its crushing strength is 2.94 tons per square inch. It is much used for boards and furniture, and is exported to Europe for cigar boxes. The trees grow singly or in small groups, preferring sloping ground. The easily accessible forests that contain cedar in Trinidad are nearly worked out. The wood is valued at 60 cents per cubic foot.

Balata, or bullet wood (*Mimusops globosa*), is a large tree 80 to 100 feet high and 4 to 6 feet in diameter. The wood is dark-red, dense, heavy, hard, very durable, and resistant to termites. It weighs 70 pounds per cubic foot, and its crushing strength is 4.77 tons per square inch. It is eminently suited for posts, bridges, and all kinds of outdoor work, and is much used by wheelwrights and for railway sleepers. It must be seasoned in the shade. Balata trees grow singly or in small groups, preferring ridges or sloping ground. The supply of this tree has been much reduced by tapping for its gum. The wood is valued at 55 cents per cubic foot.

MORA, CYP, BALSAM, AND PUY.

Mora (*Dimorphandra mora*) is a large tree 80 to 120 feet high and 2 to 5 feet in diameter, which grows gregariously on low-lying land subject to inundations and does well on poor soil. The wood is a chestnut-brown color and is hard, heavy, tough, strong, close-grained, and very durable in water or damp situations. It weighs about 65 pounds per cubic foot. It is suitable for boards, scantlings, and

especially large beams. Trees over 4 feet in diameter are often unsound. The value is 60 cents per cubic foot. Lloyd's rate mora as a first-class wood.

Cyp (*Cordia gerascanthus*) attains a height of 40 to 50 feet and a diameter of 2 to 3 feet. The light-brown wood is moderately hard, tough, and easily worked, and weighs 38 pounds per cubic foot. It is used for joinery, furniture, and cabinetwork, and is suitable for carriage building and house construction. The value is 60 cents per cubic foot.

A valuable wood used for repairs to railway cars and suitable for cabinetwork and furniture is obtained from the balsam tree (*Copai-fera officinalis*), which grows 40 to 60 feet high and 2 to 3 feet in diameter. The wood is dark reddish-brown and is finely marked and easily worked. It is valued at 70 cents per cubic foot.

Puy, or poui (*Tecoma serratifolia*), is a tree 40 to 60 feet high and 1½ to 2½ feet in diameter, growing in a mixed forest and forming only a small proportion of the growing stock. The wood is gray or green, hard, very durable, and heavy, weighing about 70 pounds per cubic foot. It is the best wood in the colony for posts and all kinds of outdoor work. It is valued at 80 cents per cubic foot.

LOCUST, PURPLE-HEART, CRAPPO, ROBLE, AND FUSTIC.

Locust (*Hymenaea courbaril*) attains a height of 60 to 80 feet and a diameter of 2 to 4 feet. The reddish-brown wood is streaked, close-grained, hard, and tough. Its weight is 69 pounds per cubic foot, and its crushing strength 5.17 tons per square inch. It will not last in the ground, but is suitable for wheelwright work. The value is 70 cents per cubic foot.

A dark-purple wood, hard, heavy, close-grained, tough, and durable is obtained from purple-heart (*Peltogyne porphyrocardia*), which grows 50 to 80 feet high and 1½ to 3 feet in diameter. The wood is suitable for furniture, cabinetwork, and buildings, but is rather difficult to work. It is valued at 80 cents per cubic foot.

Crappo, or carapa (*Carapa guianensis*), 40 to 60 feet high and 1½ to 3 feet in diameter, grows plentifully in mixed forests. The reddish wood weighs 42 pounds per cubic foot, and is durable and easily worked. It is suitable for furniture and building, but is liable to warp if used unseasoned. The value is 65 cents per cubic foot.

Roble (*Platymiscium polystachium*) is a tree 30 to 40 feet high and 1½ to 2 feet in diameter. The reddish-brown wood is hard and durable and is suitable for outdoor work, cabinet work, and furniture. Its value is 80 cents per cubic foot.

Fustic (*Chlorophora tinctoria*), 20 to 40 feet high and 1 to 2 feet in diameter, is used by wheelwrights, and yields a yellow dye, for the sake of which it is exported. The wood weighs about 44 pounds per cubic foot. Its value is \$20 to \$25 per ton.

Chapter II.—THE LUMBER MARKET.

CONSUMPTION OF DOMESTIC AND IMPORTED WOODS.

The per capita consumption of lumber (102 feet board measure) for Trinidad is doubtless higher than in any South American country. Owing to the influence of English civilization the inhabitants

have been trained to use lumber. Timber dwellings of well-designed cottage types are among the homes of Trinidad's well-to-do classes, and houses built entirely of wood are not uncommon for the laboring classes. For factory construction the use of wood is usual, as it is also for warehouses, sheds, and outhouses of farms and plantations. The following table shows the kinds, amounts, total value, and price per 1,000 feet of lumber consumed in the island:

Kinds of wood. *	Feet.	Value.	C. i. f. price.
			<i>Per 1,000 feet.</i>
Scotch fir.....	67,900	\$3,125	\$46.02
Guiana and Venezuelan hardwoods.....	79,700	3,408	42.75
White pine.....	1,076,000	54,400	32.45
Spruce.....	202,000	5,160	25.54
Hemlock.....	420,000	9,660	23.00
Southern yellow pine.....	9,013,000	271,390	30.11
Native hardwoods.....	4,732,000	234,868	.....
Total.....	16,190,600	582,011	€ 35.95

a Average.

The figures for foreign woods were taken from the Government's official records for the calendar year 1914, the latest import statistics available. While the total of imported woods in 1914 was higher than in the two preceding years by about 2,000,000 feet for 1913 and 3,000,000 feet for 1912, it is the opinion of lumber importers that the amount is not far from representing an average year's consumption under conditions of normal business.

The native hardwood figures are the average of the estimates of several responsible local lumbermen, there being no organization, private or governmental, keeping records of lumber production. Considering Trinidad's extensive forests, the fact that the Guianas and Venezuela contribute even so small a quantity as 80,000 feet of hardwoods is rather surprising.

The scarcity of sailing bottoms, even at prevailing quotations of two and a half and three times the normal freight rates, accounts for the small quantity of Canadian and American lumber at present on sale in Trinidad. Dealers are much embarrassed, some of them having less than one-fourth of their usual stocks (February, 1916).

KINDS OF WOOD IMPORTED.

SOUTHERN YELLOW PINE AND WHITE PINE.

Southern yellow pine (called pitch pine in Trinidad) constitutes 80 per cent of the imports and 56 per cent of the total lumber consumption. It is shipped to Trinidad in schooner cargoes of 800,000 to 1,000,000 feet, and comes rough, generally in two grades, "all-heart," which is the major portion, and "square-edged and sound." The schedules for rough and planed stock consist of standard American dimensions. The rough stock comes in various mixed sizes of boards, deals, and timbers from 1 by 4's up to 12 by 12's, the dressed stock in the form of planing-mill products, flooring, ceiling, molding, and partition. The c. i. f. prices of "all-heart" rough stock in normal times are \$31 to \$33; for square-edged and sound, \$25.50 to \$27 per 1,000 feet. Freights range from \$8.50 to \$10 per 1,000 feet.

White pine from North America comes to Trinidad from two sources. The better grade, which corresponds to about a "No. 1 dressing" board of the Tonawanda classification, and comes in 1 by 12 inch boards, originates in New York and is transported on steamers in parcel shipments. The ordinary stock, locally called Halifax pine, because it comes from that region of Canada, is carried by small schooners in cargoes of 500,000 to 600,000 feet, usually in boards 3 to 12 inches wide, with narrow stock predominating, and of no definite grade other than mill culls out. The c. i. f. price before the European war ranged from \$29 to \$32, and freights from \$6.50 to \$8.50 per 1,000 feet board measure.

SPRUCE, HEMLOCK, AND SCOTCH FIR.

Canadian spruce from Nova Scotia, 4/4 narrow stock in random lengths, is brought to Trinidad usually on the decks of Canadian white-pine schooners. It is sold c. i. f. on delivery at \$25 to \$26 per 1,000 feet, principally for boat boards, the siding of small boats, and several other special uses. The quantity imported is very small.

While no regular stocks of hemlock were found in any markets of South America, the wood is imported into Trinidad in parcel shipments from Nova Scotia for temporary uses, such as fences, boxes, etc., and for rough structural purposes to undersell southern yellow pine. Nearly all the stock is random, 4/4, 8, 10, and 12 inches in width, with a little 8/4. The c. i. f. price ranges from \$22 to \$24 per 1,000 feet. There is no definite grade other than sound, knotted, and square-edged.

Small amounts of Scotch fir are occasionally brought to Trinidad from England, but the lumber is little favored and is not standard on the local markets.

PROSPECT OF INTRODUCING DOUGLAS FIR.

Douglas fir was never brought to Trinidad on contract, but a large parcel consignment reached there accidentally, being part of a cargo salvaged from a near-by wrecked vessel. It was purchased at less than the cost of production. Being well seasoned and unstained, this lumber made a favorable impression, and inquiries will be made as to the practicability of importing Douglas fir through the Panama Canal after the European war to compete with southern yellow pine. If the prices of this western lumber and freight rates make Douglas-fir importation to the West Indies practicable, other Pacific-coast woods (particularly those shipped from the same ports as Douglas fir—Sitka spruce, Idaho white pine, western red cedar, and western hemlock) would have an opportunity, by reason of their more convenient sizes and better qualities, to supersede Canadian white pine, hemlock, and spruce.

DUTIES AND PORT CHARGES.

Rough lumber is subjected to a duty of \$2.03 per 1,000 feet unless shipped from a British possession, in which case it is accorded a reduction of 20 per cent and pays only \$1.62 per 1,000 feet. The general rate on dressed lumber is \$3.04 and the preferential rate is \$2.43

per 1,000 feet, superficial measure. On box shooks, staves, sash doors, and other manufactured wooden commodities not specified the general rate of duty is 10 per cent *ad valorem* and the preferential rate is 8 per cent *ad valorem*.

Only nominal harbor and quay dues are charged in Port of Spain. They are levied on a basis of the tonnage of the ship. Lumber importers figure on \$1.73 per 1,000 feet for these dues, together with the expense of handling incident to discharge and conveyance to storage. In San Fernando the wharf dues on lumber are slightly higher. They amount to about 36 cents per 1,000 feet, superficial measure.

DEMAND FOR WELL-SEASONED LUMBER.

In Trinidad the one objection to American lumber mentioned to the writer was that of sap-stain deterioration, considerable of which, it is thought, develops en route. Well-seasoned lumber is specified in all contracts for imports to Trinidad. American exporters who fail to heed this specification bring on themselves continual trouble, and often incur losses from importers' claims for deterioration allowance. Canadian exporters long ago learned this lesson. They are careful to furnish, as they contract for, shipments of well air-dried spruce and white pine. The result has been almost to eliminate claims and disputes over stain deterioration and consequently to increase the demand for the Canadian woods. Southern yellow pine, especially the lower grades, causes most of the trade disputes arising from sap discoloration. The "all-heart" wood is not given to deterioration of this character. Several times the quantity of the lower-grade ("square-edged and sound") southern yellow pine would be called for, if Trinidad importers could be assured of getting well-seasoned material.

Dressed yellow-pine stock in the form of planed boards and worked flooring, ceiling, etc., must be kiln-dried, while a few boards come, by request, soda-dipped and kiln-dried. Although much of the dressed material is entirely sap wood and is of the loblolly and shortleaf varieties (the stock most liable to sap discoloration), it is shipped dry, and consequently remains free from sap stain even when kept in stock for long periods.

STAVES.

When international business is uninterrupted by war or other world-wide disturbances, nearly 2,500,000 feet of forest material from North America comes to Trinidad in staves and heading. These materials go for making slack barrels, in which refined asphalt is marketed. Formerly the business went entirely to Canada, Nova Scotia furnishing slack stock manufactured from spruce. More recently, however, North Carolina pine (the trade name for loblolly pine) was able to enter the market. Experiments with several large consignments of these staves and heading made a favorable impression, due, it is alleged, to the fact that the wood is harder and stronger and only slightly heavier than spruce. The price, however, favors Canadian staves. In Nova Scotia the normal price for large quantities was \$5 per 1,000 pieces, while North Carolina pine was pur-

chased for \$6 per 1,000 in New York, after shipment to that port from Norfolk, Va., by water. Delivered prices at the lake in Trinidad have been \$7 to \$8 for spruce and \$8.50 to \$9.50 for loblolly pine. In full cargoes, schooners have carried many staves from Nova Scotia to Trinidad at prices as low as \$2 per 1,000. The return cargoes consist of salt. Normal steamer rates on staves from New York to Trinidad are reported to have been \$10 to \$14 per ton. Schooner delivery direct from Norfolk with slack-barrel stock of North Carolina pine or gum, or from Jacksonville with southern yellow pine, or from Mobile with yellow pine or tupelo would doubtless permanently divert this trade from Canada to the United States.

CURAÇAO.

INDUSTRIES AND LUMBER IMPORTS.

The Dutch West Indies include, besides Curaçao, several much smaller islands, such as Aruba and Buen Ayre. Curaçao has an area of 212 square miles and a population of only 31,000, most of whom inhabit Willemstad, the metropolis and capital of the island.

Lack of rainfall and deficiency of water supply prevent agriculture from assuming importance. The manufacture of a liqueur, known as curaçao, shipments of salt, shipyard activities (only for repairing schooners and similar small craft), and the operations of a coaling station for passing steamers are among the pursuits worthy of mention. Willemstad has a deep harbor and favorable geographical location, which account for its excellent steamship facilities; its greatest commercial importance is its use as a base for freight transshipment. Merchandise destined for many of the small, and a few of the large, West Indian islands is frequently routed via Curaçao. Willemstad is also the port of transshipment for most commodities coming out of and going to Maracaibo and the country sections reached from this port, in the interior of Venezuela and Colombia.

Curaçao imported 1,500,000 feet of lumber in 1914 and 500,000 feet in each of the two preceding years. Except a small quantity of Spanish cedar from Maracaibo, all the imported lumber, which represents the entire wood consumption of the Dutch West Indies, is cut from the forests of the United States. Southern yellow pine, largely heart-grade, constitutes 80 per cent of the supply, the remainder being divided between red spruce and northern white pine.

LUMBER-TRADE DIRECTORY.

Following is a list of lumber importers and dealers, lumberyards, deposits, mills, wood-pulp consumers, principal mining industries, nitrate oficinas, and railroads of Chile and sawmills, importers, and dealers of Peru, Ecuador, Colombia, Venezuela, and Trinidad. Letters to firms in these countries (except Trinidad) should be in Spanish. In all cases it is necessary to affix 5 cents postage to letters directed to these countries.

CHILE.

LUMBER IMPORTERS.

Antofagasta.

W. R. Grace & Co.^a
Lewis & Co.
Cicarelli y Cia.
Sabioncello y Cia.

Iquique.

Williamson & Balfour.^b

Valparaiso.

Wessel, Duval & Co.^c
Compton Bros. & Co.^c
Sociedad Nacional de Buques y Madera.^d

LUMBER DEALERS AND IMPORTERS.

Arica.

Nitrate Agencies (Ltd.) (W. R. Grace & Co.).
Jose L. Carlevarino.
Dauelsberg Cia.

LUMBERYARDS.

Antofagasta.

Cicarelli y Cia, Angamos, 231.
Fonolla Hnos. y Cia, Condell, 250.
Lewis y Cia., Balmaceda, 98.
Nitrate Agencies (Ltd.).
Sabioncello y Cia.
Juan E. Orchard.

LUMBERYARDS--Continued.

Coquimbo.

Jenkins y Cia.
Cuthbert y Cia., Soreno.
Yeomans y Cia., Soreno.

Iquique.

A. Bacigalupi, Amunategui, 310.
N. Lantich, Perez, 62.
Lockett Hnos. y Cia., Pinto Orella, Esmeralda, 14.
Teodoro Manns, Covadonga, 44.
Nitrate Agencies (Ltd.).
Soler Sebastian, O'Higgins, 5.

Santiago.

Alonso y Cia., Vicuna Mackenna, 640.
Carlos Briones Luco, Vicuna Mackenna, 298.
Felix Blu, San Miguel, 46.
Canas Ruiz Tagle, Avenida Las Quintas, 602.
Cisternas y Cia., Arturo Prat, 1272.
Cia. Maderera Malvon, M. Montt, 2350.
Victor Cruchaga, San Diego, 1069.
Eugenio Guzman, Avenida Las Quintas, 120.
Hoyos y de la Vega, Delicias, 3105.
Pedro Jaramillo, Carrera, 695.
Jil y Cia., Arturo Prat, 875.
Jose Marine, San Diego, 1713.
Martinez y Cia., Sama, 1576.
Pujilar y Fernandez, Vicuna Mackenna, 1042.

^a Also Santiago and all Chilean ports.

^b Also Valparaiso and all Chilean ports.

^c Also various Chilean ports.

^d Also Santiago and various Chilean ports.

CHILE—Continued.

LUMBERYARDS—Continued.

Santiago—Continued.

Romo Hnos., Pedro Lagos, 1050.
 Rivero y Cia., Esperanza, 8.
 San Marcial, Andes, 3081.
 Muenz y Montenegro, Avenida Matta, 12.
 Roberto Sepulveda y Cia., San Miguel, 142.
 Sociedad Barraca "El Lago," Salas, 150.
 Francisco Tejeda, Avenida Las Quintas, 680.
 Federico Tonkin, V. Mackenna, 266.
 Urrutia y Cia., Mapocho, 1561.
 Velasco Bravo y Cia., 10 de Julio, 450.
 Camilo Vital, Avenida Matucana, 841.
 Olivares Hnos., 10 de Julio, 321.
 Juan Orrego, Avenida Matucana, 171.
 Jose Oyaneder, Prat, 563.
 Jorge Parry, Independencia, 1014.
 Pascual Hnos., V. Mackenna, 628.
 Camilo Pizarro, Eyzaguirre, 1259.
 Prajoux Rivera y Cia., Esperanza, 8.
 Marcial Recart, Montt, 2350.
 Roca y Cia., Chacabuco, 61.
 Rodriguez Hnos., Delicias, 2739.
 Ramon Rojas, San Diego, 470.
 Pedro Sarmiento, San Diego, 787.
 Jose Torres, Villavicencio, 329.
 Claudio Valle, Delicias, 2775.
 Valle y Fuenzalida, San Diego, 701.
 Vargas y Ross, Marin, 421.
 Juan Vasquez, Prat, 855.
 Gaete Vasquez, San Alfonso, 52.
 Wenceslao Veloz, Castro, 56.
 Luis Venegas, Antofagasta, 2922.
 Sociedad Nacional de Buques y Madera, Tarapaca, 851.
 Villaroel y Mascayano, Avenida Subercaseaux, 16.
 Carlos Whiting, Davila, 1002.
 Ramon Vives, Galvez, 1272.
 Wood y Cia., San Francisco, 753.

LUMBER YARDS AND DEPOSITS.

Concepcion.

Cia. Maderera Malvoa, Barraca Blo-Blo.
 Pedro Jara, San Martin, 1018.
 Emilio Nunez, Freire, 1063.
 Manuel Rios, Andres Bello, 70.
 Eduardo Rivera, Cochrane, 858.
 Fernando Vidart, Colo-Colo, 665.

Santiago.

Barrios y Munoz, Huerfanos, 1168.
 Eduardo Bonat, Avenida Espana, 194.
 Agustin Bustos Molina, Mapocho, 3411.
 Cabrera Cirillo, Avenida Mackenna, 1025.
 Luis Canepa, Delicias, 2215.

LUMBER YARDS AND DEPOSITS—Con.

Santiago—Continued.

Rodolfo Castro, Rosas, 2022.
 Hermenegildo Ceppli, Delicias, 2312.
 Perez y Nieto, Avenida Matta, 1025.
 Darrieulat y Cia., Chacabuco, 63.
 Escobar y Verdugo, San Francisco, 753.
 Manuel Escobedo, Republica, 717.
 Escobedo y Cia., San Diego, 2330.
 Ricardo Foster, E. Escala, 2890.
 F. Garcia, Delicias, 2967; Avenida Matucana, 745.
 G. Garcia, Bello, 791.
 Julian Garcia, Delicias, 2885.
 Gentrot y Cia., Libertad, 13.
 Daniel Godfray, V. Mackenna, 298.
 Gonzalez y Cia., Serrano, 398.
 Enrique Heitmann, Carreras, 680.
 Guillermo Larios, Delicias, 2827; Mapocho, 1645.
 Lillo Pruyul y Cia., Delicias, 2631.
 Lopez y Cia., Sama, 1813.
 Saturnino Martinez, M. de Rosas, 1833.
 Carlos Montero, Delicias, 2138.
 Munna y Alonso, V. Mackenna, 640.
 Florian Niedbalski, Avenida Espana, 149.

Valparaiso.

Abel Arredondo, Avenida Colon, 120.
 Argacha y Langa, Tivola, 116.
 Campbell Iinos., General Crux.
 Hermenegildo Ceppli, Victoria esq. Olivar.
 Cia. de Maderas y Carbon, Prat, 159.
 Compton y Cia., Chacabuco, 411 y 573.
 Bautista Cretier, Cochrane, 111.
 Dominguez Ruiz y Cia., Independencia, 607-609.
 Espinoza y Cia., Blanco, 26.
 Manuel Garcia, Avenida Victoria, 574.
 Lazonby y Cia., Yungay, 55 A.
 Miguel A. Martinez, Avenida Brazil.
 Morrison y Cia., Alameda Barros, 6.
 Muro y Moreno, Chacabuco 335 y Avenida Victoria, 781.
 Navarro Araya y Cia., Olivar, 103.
 Calixto Pereira, Sub-Canciani.
 Luis Plaza y Cia., Cochrane, 479.
 Marcial Recart, Avenida Brazil.
 Sociedad Barraca "El Laja," Victoria esq. Barroso.

Sociedad Nacional de Buques y Madera, Prat, 222.
 Guillermo Valdes, Yungay, 188.
 Julio Videla, Independencia, 301.
 Luis J. Viscaya, Chacabuco, 290-353.
 Williamson, Balfour y Cia., Chacabuco, 529.

LUMBER MILLS.

Concepcion.

Barraca Entre Rios.
 Cia. Maderera Malvoa, Carreras s/n.

CHILE—Continued.

LUMBER MILLS—Continued.

Concepcion—Continued.

Sociedad Agricola e Industrial, "El Sol," Chacabuco s/n.
Koster y Wyncken, Lincoyann s/n.

Santiago.

Mateo Acosta, Vicuna Mackenna, 22A.
Luis Albear, Bascunan G., 1491.
Carlos Beagenteill, Serrano, 413.
James and Alexander Brown, Vicuna Mackenna, 70.
Santiago Bustillos, Moneda, 3051.
Agustin Bustos Mollina, Mapocho, 3411.
Hermenegildo Ceppi, Sotomayor.
Jose Cornejo, Avenida Matta, 1052.
Rafael Cruchaga, San Diego, 1069.
Duncan Duplot, Union, 336.
Domingo Degiorgis, Tarapaca, 744.
Escobar y Verdugo, San Francisco, 753.
Manuel Escobedo, Republica, 717.
M. Escobedo y Cia., San Diego, 2320.
Francisco Garcia Paz, Matucana, 743.
Emilio Girardin, Fontecilla, 146.
Daniel Godfray, Vicuna Mackenna, 298.
Felix Gonzalez y Cia., Serrano, 398.
Enrique Heilmann, Carreras, 696.
Guillermo Kupper,^a Avenida Espana, 106.

Labatut y Cia., San Francisco, 753.
Guillermo Larios, Dieciocho, 2827.
Enrique Larrian,^a Cumming, 716.
Lopez y Cia., Recoleta, 437.
Celso Maggio, Freire, 661.
Hermojenes Mardones,^a San Alfonso, 466.
Martinez Miranday, 12 de Febrero, 68.
Carlos Montero,^a San Diego, 477.
Juan Morales, 20, Esperanza, 51.
Florian Niedbalski, Avenida Espana, 149.
Juan Orrego, Matucana, 171.
Tancedo Pinochet, Clup Hipico, 1302.
Carlos Prieto, Moneda, 2241.
Drajoux Rivera, Esperanza, 8.
Eduardo Sabatin,^a Andes, 260.
Sociedad Nacional de Buques y Madera, Delicias, 3480.
Jose Torres, Villavicencio, 919.
Wenceslao Veloz S., Castro, 56.
Venegas Hnos., Tarapaca, 851.
Vizcarra Irizar, Chacabuco, 830.
Camillo Vitale, Matucana, 841.
Roberto Willingman, Maestranza, 413.

Valparaiso.

Emilio Briebach, Yungay, 20.
Bomachi Hidalgo, Olivar, 109.
Wenceslao Chavez, Retamo, 128.
Lorenzo Farren, Las Canas, 40.

LUMBER MILLS—Continued.

Valparaiso—Continued.

Abdon Garcia, Chacabuco, 671.
Guillermo Jory, Avenida Victoria s/n.
Lorenzen y Van Eps, San Juan de Dios, 180.
J. C. Lopez, Carreras, 78.
Julio Moser, Chacabuco, 422.
Navarro Araya y Cia., Olivar, 103-105.
Justino Paredes, Tubilidad, 181.
Duncan Robertson, Avenida Brazil, 87-89.
Jorge Simensen, San Enrique, 28.
Strappa y Cia., Cerro Carcel.
Gustavo Thompson, Chacabuco, 394.
R. Ulloa, Callejon Elias, 2.
Jose Luis Venejas, Freire, 5.
Williamson, Balfour y Cia., Chacabuco, 529.

WOOD-PULP CONSUMERS.

Puente Alto.

Fabricas Nacionales de Papel y Carton.
Fabrica Papel de Ebbinghaus, Hansel y Cia.

Talca.

Shorr Coucha y Cia.

PRINCIPAL MINING CONCERNS.

COAL.

Ceronel.

Cia. de Arauco (Ltd.).

Penco.

Cia. Carbonifera de Lirquen.
Cia. Minera de El Rosal.

Punta Arenas.

Menendez Bohertz y Cia.

Santiago.

Cia. Carbonifera "Los Rios de Cura-
nilahue," Compania, 1246.

Valparaiso.

Cia. de Lota y Coronel, Blanco, 533.
Cia. Carbonifera y de Fundicion
Schwager, Blanco, 669.

COPPER.

Antofagasta.

Chile Exploration Co.

Cabildo.

Otto Harnecker.

* Steam power.

CHILE—Continued.

PRINCIPAL MINING CONCERN—Con.

COPPER—Continued.

Caldera.

Sociedad Industrial de Atacama.

Chagres.

Société des Mines de Cuivre de Catemu.

Chanaral.

Société des Mines et Usines de Cuivre de Chanaral.

Copiapo.

Augusto Orrego Cortes, Mina Augustina.

The Copper Mines of Copiapo (Ltd.), Casilla, 48.

Coquimbo.

Central Chile Copper Co.

El Monte.

Société des Mines de Cuivre de Naltagua.

Freirina.

Tomas Marambio.

Huasco.

Santiago Vicuna.

Iquique.

La Grande Société Française des Mines de Cuivre Collahuasi.

The Poderosa Mining Co. (Ltd.).

Illapel.

Geisse Hnos.

Llai-Llai.

Guillermo Carvallo.

Petorca.

Jose Ramon Espinoza.

PRINCIPAL MINING CONCERN—Con.

Rancagua.

Braden Copper Co.

Santiago.

Cia. Minera Disputada, Compania, 1239.

Cia. Minera San Francisco de Las Condes, Galeria Alessandri, 10, Lorenzo Elguin, Delicias, 2081.

Serena.

Joaquin Santa Cruz, Intendencia. La Cia. Establecimientos Fundiciones, Casilla W.

Taena.

Sociedad Minera Choquelimpio.

Toecopilla.

Phoenix Mining Co.

Vallenar.

Sociedad de Minas El Orito.

Valparaiso.

Cia. Minera de Calama, Casilla, 1155. Cia. Minera de Cobre de Gatico.

GOLD.

Copiapo.

Felipe A. Matta.

Santiago.

Cia. Minera de Las Vacas, Casilla, 1610.

Cia. Minera de Curacavi.

SILVER.

Iquique.

Sociedad Internacional Minera de Huantajaya.

Taltal.

Cia. de Minas y Beneficiadora de Taltal.

CHILE—Continued.

NITRATE OFICINAS.

Oficinas.	Proprietors.	Representatives.	Headquarters.	Ports.
Abra.....	Cia. de Salitres y Ferrocarril de Agua Santa.	Cia. de Salitres y Ferrocarril de Agua Santa.	Valparaiso....	Caleta Buena.
Aconcagua (Antofagasta).	Baburizza, Bruna & Cia.	Baburizza, Bruna & Cia.	.....do.....	Mejillones.
Adriatico.....	Marinkovic, Goich & Cia.	Marinkovic, Goich & Cia.	Iquique.....	Iquique.
Aguada e.....	Cia. Comercial y Salitres La Aguada.	Cia. Comercial y Salitres La Aguada.	Pisagua.....	Pisagua.
Agua Santa.....	Cia. de Salitres y Ferrocarril de Agua Santa.	Cia. de Salitres y Ferrocarril de Agua Santa.	Valparaiso....	Caleta Buena.
Agustin Edwards (Antofagasta).	Cia. de Salitres de Antofagasta.	Cia. de Salitres de Antofagasta.	.....do.....	Antofagasta.
Alemania (Taltal)e.....	Cia. Salitrera Alemana, Suc. de Folsch & Martin.	Cia. Salitrera Alemana, Suc. de Folsch & Martin.	Taltal.....	Taltal.
Alianza (Taltal)e.....	Cia. de Salitres Alianza de Taltal Consolidada.	Cia. de Salitres Alianza de Taltal Consolidada.	Valparaiso....	Do.
Alianza e.....	The Alianza Co. (Ltd.).	Gibbs & Cia.....	Iquique.....	Iquique.
Amelia.....	The Amelia Nitrate Co. (Ltd.).	Weber & Cia.....	Valparaiso....	Caleta Buena.
Angamos (Antofagasta).e	Cia. Salitrera El Loa.	Cia. Salitrera El Loa.	.....do.....	Mejillones.
Angela e.....	The Angela Nitrate Co. (Ltd.).	Soc. Comercial Harrington, Morrison.	Iquique.....	Pisagua.
Anibal Pinto (Antofagasta).	Cia. de Salitres de Antofagasta.	Cia. de Salitres de Antofagasta.	Valparaiso....	Antofagasta.
Anita (Antofagasta)e.....	Cia. Salitrera El Loa.	Cia. Salitrera El Loa.	Iquique.....	Mejillones.
Aragon & Sacramento.....	The San Sebastian Nitrate Co. (Ltd.).	The San Sebastian Nitrate Co. (Ltd.).	.....do.....	Pisagua.
Araucana (Antofagasta)	Cia. Salitrera Lantena.	Cia. Salitrera Lantena.	.....do.....	Antofagasta.
Argentina e.....	The Rosario Nitrate Co. (Ltd.).	Gildemeister & Cia....	.....do.....	Iquique.
Arturo Prat (Antofagasta).	Cia. de Salitres de Antofagasta.	Cia. de Salitres de Antofagasta.	Valparaiso....	Antofagasta.
Atacama (Taltal)e.....	Cia. Salitrera Alemana, Suc. de Folsch & Martin.	Cia. Salitrera Alemana, Suc. de Folsch & Martin.	Taltal.....	Taltal.
Augusta Victoria (Antofagasta).	Cia. Salitrera Augusta Victoria.	Gildemeister & Cia....	Iquique.....	Antofagasta.
Aurelia (Antofagasta)e.....	The Fortuna Nitrate Co.	Gibbs & Cia.....	Valparaiso....	Mejillones.
Aurora.....	The Amelia Nitrate Co. (Ltd.).	Weber & Cia.....	.....do.....	Caleta Buena.
Aurrera e.....	Cia. Salitrera Aurrera.	Cia. Salitrera Aurrera.	.....do.....	Iquique.
Ausonia (Antofagasta)e.....	Baburizza, Bruna & Cia.	Baburizza, Bruna & Cia.	.....do.....	Mejillones.
Avanzadas (Aguas Blancas).e	Sociedad Avanzada...	Sociedad Avanzada...	.....do.....	Caleta Colose.
Ballena (Taltal).....	The Lautaro Nitrate Co. (Ltd.).	Société Commerciale Française au Chile.	.....do.....	Taltal.
Barcelona.....	Pirretas y Vallebona.	Pirretas y Vallebona.	Iquique.....	Caleta Buena.
Bellavista.....	The Alianza Co. (Ltd.).	Gibbs & Cia.....	.....do.....	Iquique.
Bonasort (Aguas Blancas).e	Granja & Cia. en liquidación.	Granja & Cia. en liquidación.	Valparaiso....	Caleta Colose.
Britannia (Taltal)e.....	The Britannia Nitrate Co. (Ltd.).	Williamson, Balfour & Co.	.....do.....	Taltal.
Buen Retiro e.....	The Colorado Nitrate Co. (Ltd.).	Lockett Bros. & Cia...	Iquique.....	Iquique.
Buena Esperanza (Toco).e	Cia. Salitrera H. B. Sloman & Cia.	Cia. Salitrera H. B. Sloman & Cia.	Tocopilla.....	Tocopilla.
Buenaventura e.....	The Buenaventura Nitrate Co. (Ltd.).	Lockett Bros. & Cia...	Iquique.....	Iquique.
Cala-Cala e.....	Pablo S. Mimbelo.....	Pablo S. Mimbelo.....	Oficina Cala-Cala.	Do.
California e.....	Perfetti, Jeffery & Cia.	Perfetti, Jeffery & Cia.	Iquique.....	Junin.
Camina e.....	Ezequiel Ossio.....	Ezequiel Ossio.....	.....do.....	Pisagua.
Candelaria (Antofagasta).e	Cia. Salitrera El Loa...	Cia. Salitrera El Loa...	Valparaiso....	Mejillones.
Carlos Condell (ex-Florencia) (Antofagasta).	Cia. de Salitres de Antofagasta.	Cia. de Salitres de Antofagasta.	.....do.....	Antofagasta.
Carmela (Antofagasta)	The Fortuna Nitrate Co.	Gibbs & Cia.....	Iquique.....	Mejillones.
Carmen Bajo.....	The Colorado Nitrate Co. (Ltd.).	Lockett Bros. & Cia...	.....do.....	Iquique.

* Not working.

CHILE—Continued.

NITRATE OFICINAS—Continued.

Oficinas.	Proprietors.	Representatives.	Headquarters.	Ports.
Castilla (Aguas Blancas). ^a	Cia. Salitrera Castilla de Antofagasta.	Cia. Salitrera Castilla de Antofagasta.	Santiago.....	Caleta Coloso.
Cecilia (Antofagasta).....	The Amelia Nitrate Co. (Ltd.).	Weber & Cia.....	Valparaiso.....	Mejillones.
Celia (Antofagasta).....	The Fortuna Nitrate Co. (Ltd.).	Gibbs & Cia.....	Iquique.....	Do.
Compania a.....	Cia. de Salitres y Ferrocarril de Junin.	Cia. de Salitres y Ferrocarril de Junin.	.....do.....	Iquique.
Condor a.....	Barrenechea Nitrate Co. (Ltd.).	Nitrate Agencies (Ltd.)	.....do.....	Junin.
Constancia a.....	Cia. Salitrera Constantia.	Gildemeister & Cia.....	.....do.....	Caleta Buena.
Cota (Aguas Blancas).....	Granja & Cia. en liquidacion.	Granja & Cia. en liquidacion.	Valparaiso.....	Caleta Coloso.
Coya (Toco).....	The Anglo-Chilean Nitrate & Railway Co. (Ltd.).	The Anglo-Chilean Nitrate & Railway Co. (Ltd.).	Tocopilla.....	Tocopilla
Chile (Taltal) a.....	Cia. Salitrera Alemania, Suc. de Folsch & Martin.	Cia. Salitrera Alemania, Suc. de Folsch & Martin.	Taltal.....	Taltal.
Cholita y Yungay Bajo a.....	The Tarapaca & Tocopilla Nitrate Co. (Ltd.).	Nitrate Agencies (Ltd.)	Iquique.....	Iquique.
Curicó (Antofagasta).....	Cia. Salitrera El Loa.....	Cia. Salitrera El Loa.....	Valparaiso.....	Mejillones.
Delaware (Taltal).....	The Dupont Nitrate Co. (Ltd.).	The Dupont Nitrate Co. (Ltd.).	.....do.....	Taltal.
Democracia a.....	Cia. de Salitres y Ferrocarril de Agua Santa.	Cia. de Salitres y Ferrocarril de Agua Santa.	.....do.....	Caleta Buena.
Diana a.....	Astoreca & Quiroga.....	Astoreca & Quiroga.....	Iquique.....	Iquique.
Domeyko (Antofagasta) a.....	Cia. Salitrera El Boquete.	Cia. Salitrera El Boquete.	Valparaiso.....	Antofagasta and Caleta Coloso.
Elena a.....	Cia. de Salitres y Ferrocarril de Agua Santa.	Cia. de Salitres y Ferrocarril de Agua Santa.	.....do.....	Caleta Buena.
Empresa (Toco) a.....	Cia. Salitrera H. B. Sloman & Cia.	Cia. Salitrera H. B. Sloman & Cia.	Tocopilla.....	Tocopilla.
Enriqueta a.....	The Zapiga Nitrate Co. (Ltd.).	Nitrate Agencies (Ltd)	Iquique.....	Pisagua.
Ercilla (Antofagasta).....	Cia. Salitrera Cerrillos.	Astoreca & Cia.....	Valparaiso.....	Mejillones.
Esmeralda a.....	Andres E. Bustos.....	Andres E. Bustos.....	Oficina Esmeralda.	Iquique.
Esperanza (Taltal) a.....	The Esperanza Nitrate Co. (Ltd.).	Williamson, Balfour & Co.	Valparaiso.....	Taltal.
Eugenio (Aguas Blancas).....	The Aguas Buenas Nitrate Co. (Ltd.).	Mitrovich Hnos.....	Antofagasta.....	Caleta Coloso.
Felisa.....	Cia. Salitrera Aurrera.	Cia. Salitrera Aurrera.	Valparaiso.....	Iquique.
Fiomena (Antofagasta).....	Baburiz, Bruno & Cia.	Baburiz, Bruno & Cia.	.....do.....	Mejillones.
Flor de Chile (Taltal) a.....	Perfetti, Jeffery & Cia.	Perfetti, Jeffery & Cia.	Taltal.....	Taltal.
Francisco Puelma (Antofagasta).....	Cia. de Salitres de Antofagasta.	Cia. de Salitres de Antofagasta.	Valparaiso.....	Antofagasta.
Galicia (ex-Cataluna).....	Nieto y Miguez.....	Nieto y Miguez.....	Oficina Galicia.	Iquique.
Ghyzela (Taltal) a.....	The Ghyzela Nitrate Co. (Ltd.).	Nitrate Agencies (Ltd.)	Iquique.....	Taltal.
Gloria.....	Luis J. Moro.....	Luis J. Moro.....	.....do.....	Iquique.
Grutas (Toco) a.....	Cia. Salitrera H. B. Sloman & Cia.	Cia. Salitrera H. B. Sloman & Cia.	Tocopilla.....	Tocopilla.
Hervatska.....	Luis J. Moro.....	Luis J. Moro.....	Iquique.....	Iquique.
Higinio Astoreca (Antofagasta).....	Astoreca & Cia.....	Astoreca & Cia.....	Valparaiso.....	Mejillones.
Huascar a.....	Cia. Salitrera Reducto.	Cia. Salitrera Reducto.	Iquique.....	Junin.
Iberia (Toco).....	Cia. Salitrera Iberia.	Cia. Salitrera Iberia.	Valparaiso.....	Tocopilla.
Irena.....	Cia. de Salitres y Ferrocarril de Agua Santa.	Cia. de Salitres y Ferrocarril de Agua Santa.	.....do.....	Caleta Buena.
Iris b.....	Astoreca & Quiroga.	Astoreca & Quiroga.	Iquique.....	Iquique.
Jazpampa a.....	The New Paccha & Jazpampa Nitrate Co. (Ltd.).	Gamble North.....	Pisagua.....	Pisagua.
Jose Santos Ossa (Antofagasta).....	Cia. de Salitres de Antofagasta.	Cia. de Salitres de Antofagasta.	Valparaiso.....	Antofagasta.
Joséfina.....	Quiroga & Lema.....	Quiroga & Lema.....	Oficina Josefina.	Caleta Buena.
Keryma a.....	Cia. Salitrera Keryma.	Cia. Salitrera Keryma.	Iquique.....	Iquique.
La Americana (Aguas Blancas). ^a	Cia. Salitrera La Americana.	Cia. Salitrera La Americana.	Valparaiso.....	Caleta Coloso.

^a Not working.

* Under construction in May, 1915

CHILE—Continued.

NITRATE OFICINAS—Continued.

Oficinas.	Proprietors.	Representatives.	Headquarters.	Ports.
La Granja.....	Granja & Astoreca.....	Granja & Astoreca.....	Valparaiso.....	Iquique
La Palma.....	The Tamarugal Nitrate Co. (Ltd.).	Buchanan, Jones & Cia.	Iquique.....	Do
La Patria ^a	do.....	do.....	do.....	Do
La Perla ^a	Sociedad Salitrera La Perla.	Sociedad Salitrera La Perla.	Santiago.....	Do
Lagunas ^a	The Lagunas Nitrate Co.	Nitrate Agencies (Ltd.).	Iquique.....	Do
Lastenia (Antofagasta) ^a	Cia. Salitrera Lastenia.	Cia. Salitrera Lastenia.	Valparaiso.....	Antofagasta.
Lautaro (Taltal) ^a	The Lautaro Nitrate Co. (Ltd.).	Société Commerciale Française au Chile.	do.....	Taltal.
Leonor (Antofagasta) ^a	The Leonor Nitrate Co. (Ltd.).	Nitrate Agencies (Ltd.).	Iquique.....	Mejillones.
Lilita (Taltal) ^a	The Lilita Nitrate Co. (Ltd.).	do.....	do.....	Taltal.
Los Pirineos ^a	Gil Galte.....	Gil Galte.....	do.....	Iquique.
Luisis (Antofagasta).....	Cia. Salitrera El Loa.....	Cia. Salitrera El Loa.....	Valparaiso.....	Mejillones.
Mapocho ^a	The Liverpool Nitrate Co. (Ltd.)	Lockett Bros. & Cia.	Iquique.....	Iquique.
Maria (Antofagasta).....	Cia. Salitrera El Loa.....	Cia. Salitrera El Loa.....	Valparaiso.....	Mejillones.
Maria Teresa (Aguas Blancas).....	Sociedad Maria Teresa.....	Sociedad Maria Teresa.....	Valparaiso.....	Caleta Coloso.
Maroussia ^a	Perfetti, Jeffery & Cia.	Cia. Perfetti y Jeffery & Cia.	Iquique.....	Caleta Buena.
Mercedes.....	A. Robledo & Cia.....	A. Robledo & Cia.....	do.....	Do.
Miraflores ^a	Sociedad Salitrera Miraflores Taltal.	Sociedad Salitrera Miraflores Taltal.	Santiago.....	Taltal.
Moreno (Taltal) ^a	Cia. Salitrera Alemania, Suc. de Folsch & Martin.	Cia. Salitrera Alemania, Suc. de Folsch & Martin.	Taltal.....	Do.
North Lagunas ^a	The Lagunas Syndicate (Ltd.).	Lockett Bros. & Cia ..	Iquique.....	Iquique.
Oriente (Aguas Blancas) ^a	Banco Espanol de Chile.	Banco Espanol de Chile.	Valparaiso.....	Caleta Coloso.
Paccha ^a	New Paccha & Jaz-pampa Nitrate Co. (Ltd.).	Gamble North.....	Pisagua.....	Pisagua.
Pampa Rica (Aguas Blancas) ^a	Cia. Salitrera Pampa Rica de Antofagasta.	Cia. Salitrera Pampa Rica de Antofagasta.	Valparaiso.....	Caleta Coloso.
Pan de Azucar ^a	The Pan de Azucar Nitrate Co. (Ltd.).	Gibbs & Cia.....	Iquique.....	Iquique.
Paposo y Limenita ^a	The Tarapaca & Tocopilla Nitrate Co. (Ltd.).	Nitrate Agencies (Ltd.).	do.....	Do.
Pena Chica ^a	Salpeterwerke, Glidemeister A. G.	Gildemeister & Cia.....	do.....	Do.
Pepita (Aguas Blancas) ^a	Granja & Cia. en liquidación.	Granja & Cia. en liquidación.	Valparaiso.....	Caleta Coloso.
Peregrina (Toco) ^a	The Anglo - Chilean Nitrate & Railway Co. (Ltd.).	The Anglo - Chilean Nitrate & Railway Co. (Ltd.).	Tocopilla.....	Tocopilla.
Perseverancia (Antofagasta).....	Cia. Salitrera Perseverancia.	Cia. Salitrera Perseverancia.	Santiago.....	Mejillones.
Peruana ^a	The Colorado Nitrate Co. (Ltd.).	Lockett Bros. & Cia...	Iquique.....	Iquique.
Petronilia (Aguas Blancas) ^a	Cia. Maria Teresa.....	Cia. Maria Teresa.....	Valparaiso.....	Caleta Coloso.
Pissis (Antofagasta) ^a	Cia. Salitrera E Boquete.	Cia. Salitrera E Boquete.	do.....	Antofagasta and Caleta Coloso.
Porvenir ^a	Cia. Nacional de Salitres La Union.	Cia. Nacional de Salitres La Union.	Santiago.....	Junin.
Primitiva ^a	Cia. de Salitres y Ferrocarril de Agua Santa.	Cia. de Salitres y Ferrocarril de Agua Santa.	Valparaiso.....	Caleta Buena.
Progreso.....	Evaristo Quiroga y Hno.	Evaristo Quiroga y Hno.	Iquique.....	Do.
Prosperidad (Toco) ^a	Cia. Salitrera H. B. Sioman & Cia.	Cia. Salitrera H. B. Sioman & Cia.	Tocopilla.....	Tocopilla.
Providencia.....	Gil Galte.....	Gil Galte.....	Iquique.....	Iquique.
Puntiña de Huara ^a	The Rosario Nitrate Co. (Ltd.).	Gildemeister & Cia.....	do.....	Caleta Buena.
Puntunchara.....	The London Nitrate Co. (Ltd.).	Buchanan, Jones & Cia.	do.....	Do.
Ramirez.....	The Liverpool Nitrate Co. (Ltd.).	Lockett Bros. & Cia.	do.....	Iquique.

* Not working.

CHILE—Continued.

NITRATE OFICINAS—Continued.

Oficinas.	Proprietors.	Representatives.	Headquarters.	Ports.
Recuerdo a.....	Cia. de Salitres y Ferrocarril de Junín.	Cia. de Salitres y Ferrocarril de Junín.	Iquique.	Junin.
Reducto.....	Cia. Salitrera Reducto.	Cia. Salitrera Reducto.	.....do.....	Do.
Restauracion a.....	Sociedad Salitrera Restauracion	Sociedad Salitrera Restauracion	Santiago.....	Iquique.
Resurreccion (ex-Iquique). ^a	Andres E. Bustos.....	Andres E. Bustos.....	.....do.....	Do.
Rica Aventura (Toco). ^a	Cia. Salitrera H. B. Sloman & Cia.	Cia. Salitrera H. B. Sloman & Cia.	Oficina Esmeralda, Tocopilla.....	Tocopilla.
Riviera (Antofagasta). ^a	Cia. Salitrera Riviera.	Cia. Salitrera Riviera.	Valparaiso.....	Antofagasta.
Rosario de Huara.....	The Rosario Nitrate Co. (Ltd.).	Gildemeister & Cia....	Iquique.....	Caleta Buena.
Rosario (Aguas Blancas).	Cia. Chilena de Salitres.	Bruna, Sampayo & Cia.	Valparaiso.....	Caleta Coloso.
Sacramento y Aragon a.	The San Sebastian Nitrate Co. (Ltd.).	Sociedad Comercial Harrington Morrison.	Iquique.....	Pisagua.
Salinitas (Taltal) a.....	Cia. Salitrera Alemana, Suc. de Folsch & Martin.	Cia. Salitrera Alemana, Suc. Folsch & Martin.	Taltal.....	Taltal.
San Antonio.....	Cia. de Salitres y Ferrocarril de Junín.	Cia. de Salitres y Ferrocarril de Junín.	Iquique.....	Junin.
San Donato.....	The Liverpool Nitrate Co. (Ltd.).	Lockett Bros. & Cia.....	.....do.....	Iquique.
San Enrique ^a	Suc. de Lorenzo Ceballos.	Suc. de Lorenzo Ceballos.	Santiago.....	Do.
San Francisco.....	Juan Vodnizza.....	Juan Vodnizza.....	Iquique.....	Junin.
San Gregorio (Aguas Blancas). ^a	Cia. de Salitres La Americana.	Cia. de Salitres La Americana.	Valparaiso.....	Caleta Coloso.
San Jorge.....	Moldes, Gago & Cia....	Moldes, Gago & Cia....	Iquique.....	Caleta Buena.
San Jose.....	Salpeterwerke Gildemeister A. G.	Gildemeister & Cia.....	.....do.....	Iquique.
San Lorenzo.....	The San Lorenzo Nitrate Co. (Ltd.).	Lockett Bros. & Cia.....	.....do.....	Do.
San Manuel ^a	North Benavides & Cia.	North Benavides & Cia.	Oficina San Manuel.	Do.
San Pablo ^a	Suc. de George Jeffery	Suc. de George Jeffery	Iquique.....	Do.
San Patricio ^a	The San Patricio Nitrate Co. (Ltd.).	Nitrate Agencies (Ltd.).	.....do.....	Pisagua.
San Pedro ^a	Salpeterwerke Gildemeister A. G.	Gildemeister & Cia.....	.....do.....	Iquique.
San Remigio.....	Marinkovic & Goich.	Marinkovic & Goich.	.....do.....	Do.
Santa Ana ^a	The Tarapaca & Tocopilla Nitrate Co. (Ltd.).	Nitrate Agencies (Ltd.).	.....do.....	Do.
Santa Catalina ^a	The Santa Catalina Nitrate Co. (Ltd.).	Sociedad Comercial Harrington, Morrison.	.....do.....	Pisagua.
Santa Catalina (Taltal) a.....	The Lautaro Nitrate Co. (Ltd.).	Société Commerciale Française au Chile.	Valparaiso.....	Taltal.
Santa Clara ^a	Salpeterwerke Gildemeister A. G.	Gildemeister & Cia.....	Iquique.....	Iquique.
Santa Elena.....	Andres E. Bustos.....	Andres E. Bustos.....	Oficina Esmeralda.	Do.
Santa Fe (Toco).....	The Tarapaca & Tocopilla Nitrate Co.	Nitrate Agencies (Ltd.).	Iquique.....	Tocopilla.
Santa Isabel (Toco)	The Anglo - Chilean Nitrate & Railway Co. (Ltd.).	The Anglo - Chilean Nitrate & Railway Co. (Ltd.).	Tocopilla.....	Do.
Santa Lucia ^a	The Salar del Carmen Nitrate Syndicate.	Sociedad Comercial Harrington, Morrison.	Iquique.....	Iquique.
Santa Luisa (Taltal)....	The Lautaro Nitrate Co. (Ltd.).	Société Commerciale Française au Chile.	Valparaiso.....	Taltal.
Santa Rita y Carolina ^a .	The Santa Rita Nitrate Co. (Ltd.).	Nitrate Agencies (Ltd.).	Iquique.....	Pisagua.
Santa Rosa de Huara ^a ..	Suc. de George Jeffery.	Suc. de George Jeffery.	.....do.....	Iquique.
Santiago ^a	The Santiago Nitrate Co. (Ltd.).	Nitrate Agencies (Ltd.).	.....do.....	Caleta Buena.
Sara ^a	North Benavides & Cia.	North Benavides & Cia.	Oficina Sara.....	Iquique.
Savona (Antofagasta) ..	Comunidad Salitrera Poderosa de El Boquete.	Comunidad Salitrera Poderosa de El Boquete.	Valparaiso.....	Antofagasta.
Sebastopol ^a	Hidalgo & Cia.....	Banco Italiano.....	Iquique.....	Iquique.
Serenas ^a	Buchanan, Jones & Cia.	Buchanan, Jones & Cia.	.....do.....	Do.

*Not working.

CHILE—Continued.

NITRATE OFICINAS—Continued.

Oficinas.	Proprietors.	Representatives.	Headquarters.	Ports.
Slavonia ^a	The Alianza Co.....	Gibbs & Cia.....	Iquique.....	Iquique.
South Lagunas ^a	The Lagunas Syndicate (Ltd.), Suc. de George Jeffery.	Lockett Bros. & Cia.....	.....do.....	Do.
Tarapaca ^a	The London Nitrate Co. (Ltd.).	Suc. de George Jeffery.	.....do.....	Do.
Transito.....	The London Nitrate Co. (Ltd.).	Buchanan, Jones & Cia.	.....do.....	Caleta Buena.
Tres Marias ^a	Perfetti, Jeffery & Cia.	Perfetti, Jeffery & Cia.	.....do.....	Do.
Tricolor (Taltal) ^a.....	.....do.....	.....do.....	Taltal.....	Taltal.
Trinidad ^a	The Lagunas Nitrate Co. (Ltd.).	Nitrate Agencies (Ltd.).	Iquique.....	Pisagua.
Union ^a	Cia. Nacional de Salitres La Union.	Cia. Nacional de Salitres La Union.	Santiago.....	Junin.
Valparaiso ^a	Cia. de Salitres y Ferrocarril Aguas Santa.	Cia. de Salitres y Ferrocarril de Agua Santa.	Valparaiso.....	Caleta Buena.
Valparaiso (Aguas Blancas) ^a	Cia. Salitrera Valparaiso.	Cia. Salitrera Valparaiso.	Santiago.....	Caleta Coloso.
Victoria (ex-Sloga).....	Cia. de Salitres y Ferrocarril de Junin.	Cia. de Salitres y Ferrocarril de Junin.	Iquique.....	Junin.
Virginia ^a	The Tarapaca & Tocopilla Nitrate Co. (Ltd.).	Nitrate Agencies (Ltd.).	.....do.....	Iquique.
Via ^a	Pablo y Luis Mitrovich.	Mitrovich Hnos.....	Valparaiso.....	Do.

^a Not working.

CHILEAN RAILROADS.

Names.	Length.	Gauge.	Ports.	Purchasing representatives.	Secretary of directors.
Ferrocarril de Guaquia a La Paz.	82	1 meter..	Arica.....	A. B. Casey, La Paz..	H. D. Yates, 43-46 Threadneedle Street, London E. C.
Ferrocarriles del Estado....	1,823	5 feet 6 inches, and 1 meter.	Various.....	S. Perez Pena, Santiago.	
Ferrocarriles Aislados ^a	680				
Ferrocarril Arica-La Paz ^a	410	1 meter.			
Cia. Ferrocarril de Aguas Blancas.	142	2 feet 6 inches.	Antofagasta.	Company, Antofagasta	
Anglo-Chilean Nitrate.....	130	3 feet 6 inches.		C. P. Gates, Tocopilla.	D. E. Stirling, 13 Fenchurch Ave. London.
Ferrocarril de Antofagasta a Bolivia.	1,120	2 feet 6 inches.	Antofagasta.	F. D. Mertz, Antofagasta.	A. W. Bolden, 1 Broad St., London.
Arauco.....	88	5 feet 6 inches.	Coronel.....	R. H. Browne, Coronel	J. Edwards, 80 Bishopsgate, London.
Ferrocarril de Arica y Tacna.	52	4 feet 8½ inches.	Arica.....	R. D. T. Roe, Tacna...	T. J. Millen, 31 Lombard St., London.
Cabildo-Toledo ^a	506				G. A. Tinley & Co., 34 Castle St., Liverpool.
Carrizal & Cerro Blanco.....	134	4 feet 2 inches.	Carrizal.....	J. King, Carrizal.....	W. Stewart Lane, Chapel House, New Broad St., London, E. C.
Chilean Eastern Central-Lebu-Los Sauces.	91	5 feet 6 inches.			H. G. Clarke, & Princes St., London, E. C.
Chilean Longitudinal (southern section) (see Cabildo-Toledo).					
Chilean Northern (Puebla Hundido to Pintados). ^b	446				

^a Part of Chilean State Railways.^b Northern section of the Chilean Longitudinal Railway

CHILE—Continued.

CHILEAN RAILROADS—Continued.

Names.	Length.	Gauge.	Ports.	Purchasing representatives.	Secretary of directors.
Chilean Transandine (Los Andes to frontier).	Miles. 44	1 meter..	Valparaiso..	J. H. White, Los Andes.	Alfred Martin, 144 Leadenhall St., London.
Ferrocarril de Copiapo ^a	62	2 feet 6 inches.	Iquique.....	D. Richardson, Iquique.	
Cia. de Salitres y Ferrocarril de Junin.		4 feet 8½ inches.	.....	Jas. Mayne Nicholls, Iquique.	G. L. H. Axworthy, 110 Cannon St., London.
Ferrocarriles Salitreros.....	526				D. R. Finnis, River Plate House, 10-11 Finsbury Circus, London.
Taltal.....	252	3 feet 6 inches.	Taltal.....	Bertram Norton, Taltal.	A. C. Watson, 25 Broad St., New York.
Guayaquil & Quito (Ecuador).	288	3 feet 6 inches.	Guayaquil..	Geo. O. Houston, New York.	
Empresa Minera "La Azucarera Sechura" (Peru).	27	1 meter..	.....	E. M. Palacios, Bivavar.	

* Part of Chilean State Railways.

PERU.

LUMBER IMPORTERS.

W. R. Grace & Co.^aW. & J. Lockett.^aMilne & Co.^bGraham, Rowe & Co.^aDuncan Fox & Co.^a

LUMBER DEALERS.

Arequipa and Mollendo.

Cia. y Fabrica de Elaborar Maderas (Ltd.).

Enrique W. Gibson.

James Vueetich, Grand Barraca.

Callao.

Clapham & Co.

M. Fortunio.

E. Guinecchi & Co.

LUMBER DEALERS—Continued.

Lima.

Luis G. Ostolaza.

Lima and Callao.

Ciurlizza, Maurer & Co.

Sanguineti Dasso.

Lima Lumber Mills.

Mollendo, Peru, and La Paz, Bolivia.

Barraca Hirshman & Co.^cGeorge Saens.^c

LARGE BUYERS.

Lima.

Cerro de Pasco Mining Co.

Backus & Johnston Co.

Peruvian Corporation.

Milne & Co.^bW. & J. Lockett.^a

ECUADOR.

SAWMILLS AND LUMBER DEALERS.

Guayaquil.

La Infatigable (Manuel Genaro Gomez).

Camilo Palomeque.

La Palma (Donata Yannuzelli).

El Pailon (Guillermo Weir).

San Francisco (Fortunato Salcedo).

La Mercedes (Francisco Robles).

La Maria (Alfredo Valenjuela R.).

Paget y Berkut.

Emilio Jarrin E.

SAWMILL AND LUMBER DEALERS—Continued.

Guayaquil—Continued.

La Precursora. (Sues. de Sanprieto).

Sta. Rosa. (Francisco Parra. D.).

La Machangara (Adolfo or Loney Mata).

IMPORTERS.

Guayaquil.

Guayaquil Agencies Co. (W. R. Grace).

Andean Trading Co.

^a In nearly every port and regional metropolis of Peru.^b Same management as Williamson, Balfour & Co., Valparaiso.^c Largest dealers.^d Agent for large plantations.

COLOMBIA.

SAWMILLS AND LUMBER DEALERS.

Barranquilla.

Abuchar Hnos.
Tomas Suri Salcedo y Cia.
Pineda Lopez y Cia. (shipbuilding).
Barranquilla Railway & Pier Co. (G. Irvine, manager).

Bogota.

C. E. Caballero & Bros.

Cartagena.

Velez Danies y Cia.
Cartagena Railway Co. (Pinedo Lopez y Cia., agents).

SAWMILL AND LUMBER DEALERS—Continued.

Cartagena—Continued.

Diego Martinez y Cia.
George G. Emery (American importer).

Medellin.

Abelardo Ochoa.
Ignacio Uribe.
Pablo Emilio Vasquez.
Vasquez Hnos. y Cia.
Arturo Botero.
Victor Manuel Garcez.

Santa Marta.

Santa Marta Railway Co.
Manuel T. De Mier.

VENEZUELA.

SAWMILLS AND LUMBER DEALERS.

Cagua.

Joaquin Gonzalez, successors.*

Caracas.

N. Rios y Cia.*
Misle y Cia.*
Matos y Cia.*
V. Vallenilla Lecuna V.
Angel G. Pinedo.

SAWMILL AND LUMBER DEALERS—Continued.

Maracaibo.

Pinedo y Cia.

Puerto Cabello.

Ferdinandez Caprales & Co.*
V. Vallenilla Lecuna V.*

TRINIDAD.

SAWMILLS AND LUMBER DEALERS.

Port of Spain.

Alston & Co.*
Geo. R. Huggins & Co.*
Trinidad Shipping & Trading Co.*
Gilles & Taylor.
Robertson & Co.

SAWMILL AND LUMBER DEALERS—Continued.

San Fernando.

Tennant Son & Co. (Ltd.).*

[Blue prints showing the patterns and sizes of standard doors and windows in Chile and Peru, and additional illustrations for all the countries treated may be examined at the Bureau of Foreign and Domestic Commerce or its district offices. Refer to file Nos. 772 (Chile), 816 (Peru), 887 (Ecuador), 891 (Colombia), and 910 (Venezuela).]

* Importers of United States lumber.



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